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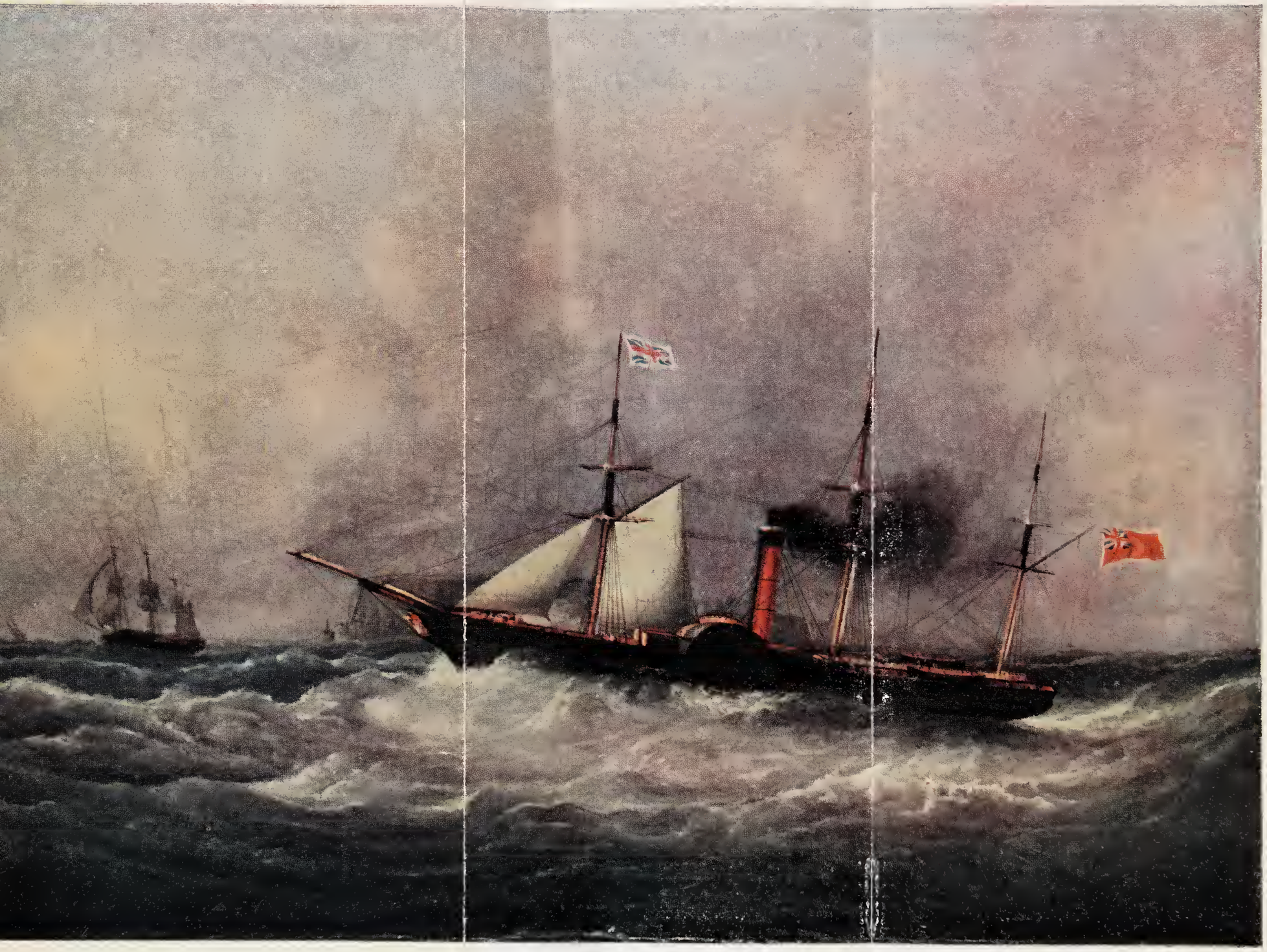
THE BLUE RIBAND



"Britannia," The First Cunarder

[*Reproduced by courtesy of Charles Livingston, Esq.*

Pioneer of Regular Steam Navigation Across the Atlantic, which Sailed from Liverpool on July 4, 1840

[*Frontispiece*

THE BLUE RIBAND

THE ROMANCE OF THE ATLANTIC FERRY

BY

CHARLES E. LEE

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THE HON. SIR CHARLES A. PARSONS

O.M., K.C.B., F.R.S., ETC.

TO WHOSE OUTSTANDING GENIUS
ARE DUE THE PHENOMENAL SPEEDS
OF THE MODERN OCEAN LINER

FOREWORD

It would be a bold person who essayed the task of forecasting what the future has in store in the field of rapid transport. It may be that the next decade will see the mail and express passenger traffic carried by air over the great ocean routes, leaving the steamship, or her young sister the motorship, to carry at more economical speeds the less urgent trade.

On the North Atlantic at present the proud distinction of maintaining speedy and safe regular communication between two great continents and two mighty nations still remains the steamship. How this service has been built up is one of the romances of which we, as a maritime nation, may well be proud.

The title "The Blue Riband of the Atlantic" has long been popularly applied to the fastest passage between the European and American shores, and no more suitable one could be given to our story. To confine our attention to those vessels

which, for the time being, have held the coveted honour, would give no true picture, and in the following pages the attempt has been made to deal with the rise and progress of those steamship lines which have catered for the first-class express traffic on the Western Ocean.

Thus, size and comfort as well as greatest speed have been deemed adequate reasons for mention, while among the illustrations the net has been spread even more widely. To secure such a selection of pictures, assistance has been sought in many directions and freely given. Among those to whom thanks are especially due are the Editors of "Shipbuilding and Shipping Record" and "The Marine Engineer," and the officials of the Cunard Steamship Company, the White Star Line, and the Norddeutscher Lloyd. All have placed records at my disposal, have kindly loaned illustrations, and have assisted materially in many ways.

Also, as is inevitable with any volume covering historical matters, data have been obtained from numerous sources to which individual reference is impossible, but, among these, the writings of Arthur J. Maginnis, and Frank C. Bowen are works for which future historians must ever be grateful.

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THE BLUE RIBAND

CHAPTER I

PIONEER STEAMERS OF THE ATLANTIC

In the whole history of transport there is probably no single route which has inspired popular imagination, or attracted so much interest, as has the North Atlantic steamship service. This is a natural consequence of the fact that the North Atlantic divides the various settlements of the Nordic races. In other words, the leading White countries all border on this ocean, and have frequent occasion to span it in order to maintain communication with their cousins of the "Other World." Long before the application of the steam engine to ships, the transatlantic route was the competition ground for some of the fastest lines of sailing clippers. Most of the sailing honours were held by the Americans, among which the Black Ball Line, founded in New York in 1816, averaged 22·12 days on the eastward journey

from New York to Liverpool, and 33·17 days westward.

It is, therefore, but natural that the North Atlantic should attract the early attention of the pioneers of steam navigation. The steam engine itself was entirely a British invention, but its experimental application to ship propulsion was made more or less simultaneously in both Great Britain and America. It would be out of place to discuss here the merits of the various claimants to priority in adapting the steam engine to drive a paddle wheel and so provide motive power for vessels. Apparently the earliest claim is in respect of a Spanish ship built at Barcelona under the direction of Blasco de Garey in 1543.

Whatever be the merits of this claim, more than two centuries had passed before we reached the era in which experimenters on both sides of the Atlantic produced more or less successful results, and so laid the foundations of the present great industry. One of those who had a fair measure of success with his steamer was John Fitch, whose craft plied for hire on the Delaware in 1787. Fitch was a far-seeing man, and on

more than one occasion is recorded as having expressed his considered opinion that steam was destined to provide the driving force for packets and armed vessels crossing the Atlantic, and, indeed, on the majority of the world's trade routes.

His foresight did not finish here, and, at the expense of being considered mad by his friends, he stated that steamboats would be preferred to all other means of conveyance, especially for passengers. At first sight this does not appear to be a very remarkable pronouncement, but it should be recalled that there was very little passenger traffic of any sort in the eighteenth century, and certainly no great care was taken to provide comfortable accommodation for those few who did travel.

Some few years were yet to pass before Fitch's forecasts began to be realised, and it was not until Robert Fulton ran his steamer *Clermont* on the Hudson in 1807 and Bell's *Comet* began plying on the Clyde in 1812, that steam navigation entered upon its period of continuous progress.

Credit has frequently been given to the *Savannah* as being the first steamer to cross the Atlantic. This vessel was certainly the first to make the trip with the aid of steam machinery, but this was quite inadequate to have carried her across the Atlantic, and in fact, out of a passage of four weeks, the engine was in use for less than four days.

The *Savannah* was built in New York in 1819 by Fickett and Crocker. She was built as a sailing ship of about 350 tons, and after completion, was equipped with a single-cylinder steam engine giving an indicated horse-power of about 90, and propelling the vessel at a speed in the neighbourhood of 6 knots, with a coal expenditure of a little over one third of a ton per hour. The paddle wheels were so constructed that they could readily be taken in board.

The *Savannah* was despatched by Colonel John Stevens from New York on Monday, May 24, 1819, and arrived at the mouth of the Mersey on Sunday, June 20. As already mentioned, the actual continuous working of the engines was only a little over three complete days during the whole voyage. It may be added that she left

America with only 75 tons of coal and a quantity of wood fuel on board. After her arrival at Liverpool she made a voyage to the Baltic and then returned to America, where her machinery was removed in the following year. She continued trade as a sailing ship until being wrecked on Long Island in 1822. The exact object of equipping the *Savannah* with an engine is not known, as it must have been obvious from the start that the low power and meagre bunker capacity would prevent the vessel from making a trip of any length under steam. It is possible that ease of manœuvreability in and out of port was the object. Certainly she made no material contribution to the progress of steam navigation, and has no just claim to premier place on the North Atlantic.

During the years 1827 to 1829, a Dutch-owned steam vessel, the *Curaçoa*, made more than one passage across the Atlantic. On her first voyage, from Rotterdam to Surinam in the West Indies, she took 27½ days. The *Curaçoa* was a 436-ton vessel, built at Dover, but practically nothing is known about her propelling machinery, although it is almost certain that this was entirely

inadequate to perform the passage, and there is little doubt that this vessel, like so many steamships both then and for many years afterwards, carried a good deal of sail, and relied on this very largely for the major portion of the trip.

It was not until 1833 that the Atlantic was crossed entirely under steam power, the ship to have this honour being the Canadian-built vessel, *Royal William*. Before considering this trip, however, we must make brief mention of H.M.S. *Rhadamanthus*, which, in April and May of that year, went from Plymouth to Madeira and thence to Barbados. From her log in the Public Record Office, it is seen that her engine was in use for about half the voyage, and as this was more or less a fair weather passage the machinery doubtless proved of service. The *Rhadamanthus* was a vessel of about 800 tons, and was one of the first steam-driven fighting ships. Her engine gave a nominal horse-power of about 200.

Returning now to the *Royal William*, we find that she was built for trading between Quebec and Halifax; and spent the first two years of her

life in this service. The ship was built at Three Rivers, near Quebec, in 1831 by James Goudie, and had dimensions of 160 ft. by 44 ft. The machinery, of 200 nominal horse-power, was built at Birmingham by Bolton and Watt, and sent out from England for installation.

It was decided in 1833 to despatch the vessel to Gravesend, and she left Quebec on August 4, and arrived at Gravesend on September 9, having called at Pictou, N.S., for coaling, and also put in at Cowes before completing her journey through the English Channel to the Thames.

The *Royal William* has another and even greater claim to fame in introducing the personality of Samuel Cunard, to whose efforts the commencement of regular transatlantic steamship service is due, and who was intimately identified with so many of the early developments. The *Royal William* cost about £16,000 to build, and Cunard's name heads the list of 144 subscribers who found the money for the venture. Even prior to this time, his foresight had visualised the establishment of regular communication by steam vessels between Great Britain and the whole of

the eastern seaboard of the North American continent. The performance of the *Royal William* must have played its part in confirming his views and encouraging him to expend such strenuous and successful efforts a few years later in forming the famous line which still bears his name.

CHAPTER II

ESTABLISHING REGULAR SERVICES

So far the various voyages which we have considered have been individual trips entirely unconnected with any definite scheme for the establishment of a regular line of steamships across the Atlantic. Indeed, at this period very few people believed in the possibility of maintaining such a service or that steam was ever likely to supersede sail. Views of this character were given considerable weight by the pronouncement of Dr. Dionysius Lardner, a then well-known scientist, who is now chiefly remembered for the strongly worded and definite opinions which he voiced against so many of the engineering feats proposed by practical engineers of the day, and which were successfully achieved within a year or two. Just as various soundly organised schemes were before the public, Dr. Lardner

delivered a lecture at Liverpool in which, as reported in the *Liverpool Albion*, of December 14, 1835, he stated that "as to the project which was announced in the newspapers of making the voyage directly from New York to Liverpool, it was, he had no hesitation in saying, perfectly chimerical, and they might as well talk of making a voyage from New York to the Moon."

Even such an influential personage as the great Duke of Wellington stated that "he would give no countenance to any schemes which had for their object a change in the established system of the country."

The first recorded attempt to establish regular steam navigation across the Atlantic took place in the 'twenties of last century, when a few enterprising individuals proposed to run a scheduled service from the west coast of Ireland to the United States. It is interesting to notice that the west of Ireland was selected as the European terminus, as ports on this coast have attracted attention time and again during the past century. This land is the extreme outpost of Europe, and, therefore, the nearest to the American continent, but various practical difficulties, such as that of

the overland transport to London and the various industrial centres, have always prevented the development of such schemes.

The Valencia Transatlantic Steam Navigation Company was formed in 1825, but nothing was done towards building vessels, and no practical results ensued. It was not until the 'thirties that any plans were propounded which actually resulted in the construction of the requisite ships, and the commencement of sailings. Prominent among these was the scheme mooted by Isambard Kingdom Brunel, the son of Sir Marc Isambard Brunel, himself a distinguished engineer. When only twenty-seven years of age he became engineer to the Great Western Railway Company in March, 1833, at a time when that company was seeking Parliamentary powers for a railway between London and Bristol. As soon as these were obtained, at the end of August, 1835, Brunel urged the shareholders to build a steamship to extend their line from Bristol to New York. It was at the general meeting of the Great Western Railway Company in October, 1835, that the details were made public. At first the idea was ridiculed, but before very long

Brunel found a sufficient number of the shareholders who had faith in him to finance a company, known as the Great Western Steamship Company, to build the vessel.

Once it was decided to build her, the work was hurried on as much as possible in order to get ahead of the *British Queen*, which was being built for a rival undertaking.

The designer and builder of the *Great Western* was William Patterson, of Bristol, and the registered owner was the Great Western Steamship Company. She was very strongly built of wood, her scantlings being equal to those of a line-of-battleship, while additional strength was obtained by having a solid bottom and diagonal bracing of the frames. Her dimensions were 236 ft. overall, 212 ft. between perpendiculars by 35·4 ft. beam inside the paddles, and 58·4 extreme. The load draught was 16 ft. Her tonnage was 1,340 burthen, 679 net.

As soon as she was in the water she was towed round to London to receive the engines which had been built for her by Maudslay, Sons & Field, engines built to the design and under the supervision of I. K. Brunel, who was so enthusiastic

over the scheme that he gave his services gratuitously. They were the largest marine engines that had been constructed up to that date, of 450 nominal and 750 I.H.P.

The *Great Western* was capable of carrying 200 tons of cargo in addition to her 600 tons of bunkers and the necessary stores, while she had accommodation for 128 first and 20 second-class passengers, and a crew of 60. The main portion of the saloon was 75 ft. long by 21 ft. wide, with a 9-ft. head room, while there was a smoke-room 24 ft. long at the end, and recesses at the sides.

Some 20,000 people were present when she was launched at Bristol on July 19, 1837, and there was intense interest when she left the Thames for Bristol, under her own steam, at the end of the following March. Unfortunately, the felt lagging of the boilers took fire and cleared the stokeholds, whereupon her naval master beached her on Canvey Island until the amount of damage could be ascertained. There was nothing serious, but the news of the accident spread, and a number of passengers forfeited their passage-money, only seven finally deciding to sail in her.

While the *Great Western* was building, a rival undertaking known as the British & American Steam Navigation Company, of which the leading spirit was John Laird, of Birkenhead, were pushing ahead with their vessel, the *British Queen*. She was laid down by Curling & Young on the Thames, and was at first intended to be called *Victoria*, doubtless in honour of the young Queen who had just ascended the British throne. Girdwood & Co., of Glasgow, were building the engines for the *British Queen*, but the firm went bankrupt before these were completed, and the failure caused a delay of about a year and prevented the vessel sailing in 1838 as had been intended.

The formation of the British & American Steam Navigation Company in July, 1836, was, to a great extent, the work of Junius Smith, an American lawyer. Born in 1780, Smith had a successful practice, and came to England to fight a case on behalf of an American ship. This led to a long residence in this country, and from the law he turned to commerce. In August, 1832, he crossed to New York in the sailing vessel *St. Leonard*, the passage taking 54 days. He

returned from New York in December in the packet ship *Westminster* which took 32 days to reach Plymouth. It was these two passages which gave birth to the idea of founding a line of steamships, and in a letter written in London on June 28, 1833, Smith said: "Thirty-two days from New York to Plymouth is no trifle, any ordinary seafaring steamer would have run it with the weather we had in fifteen days with ease. I shall not relinquish the project unless I find it absolutely impracticable." At first received with opposition and indifference, Smith's views gradually gained supporters. He found a most able and enthusiastic colleague in Macgregor Laird, the brother of John Laird, of Birkenhead, and when the subscription lists were opened in July, 1836, capital was readily forthcoming, and Smith was able to inform his New York correspondents that the company had contracted for the building of "the largest and intended to be the most splendid steamship ever built, expressly for the New York and London trade. She will measure 1,700 tons, 200 ft. keel, 40 ft. beam, 3 decks and everything in proportion. She will carry two engines of 225 horse-power each, 76-in. cylinder,

and 9 ft. stroke. The expense of this steam-frigate is estimated at £60,000. These large undertakings require time to mature, but I think the business will at last be done effectually."

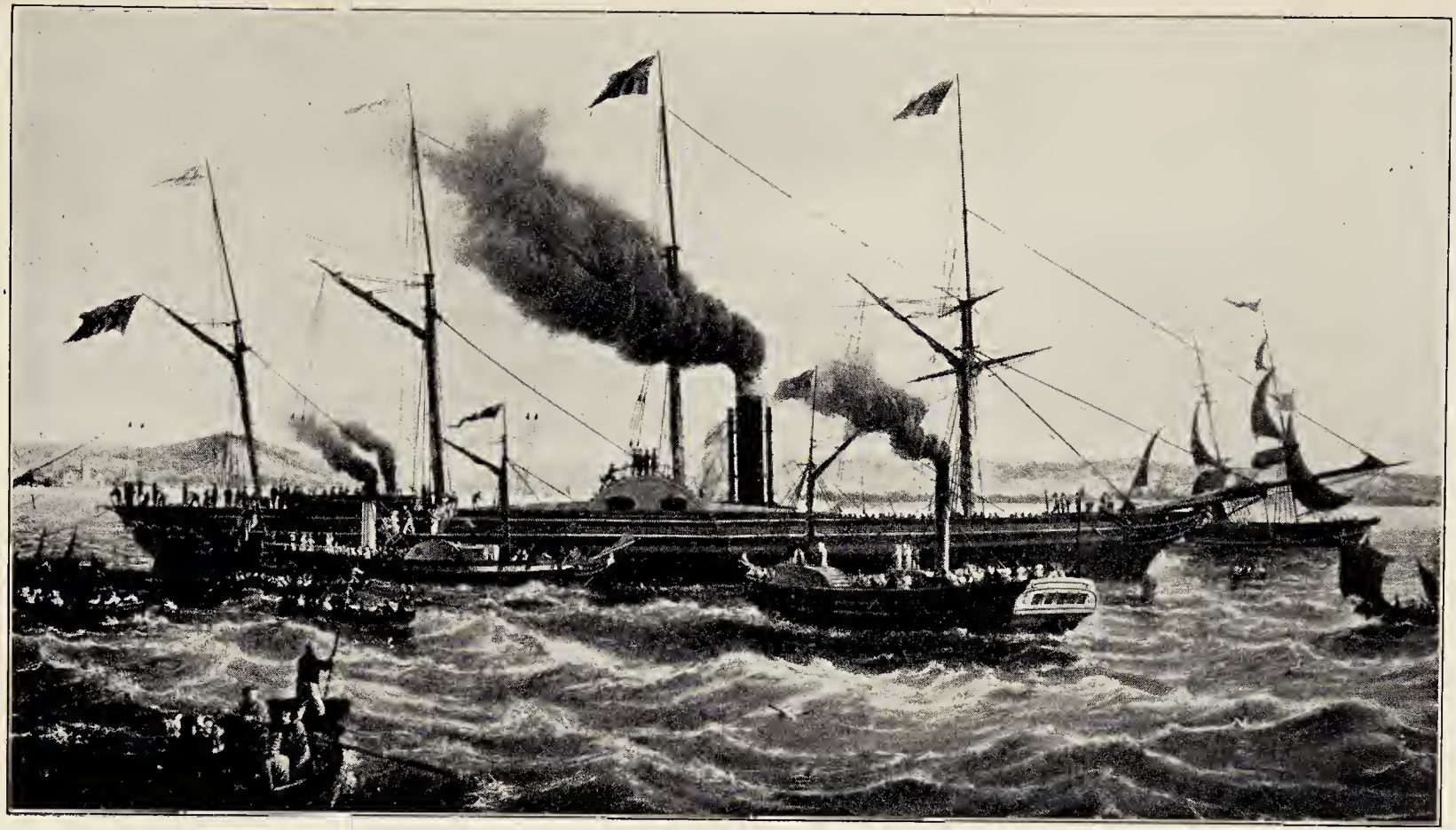
When the *Great Western* was ready to sail, the British & American Steam Navigation Company decided to charter from the St. George's Steam Packet Company their little steamship, *Sirius*. She was only 178 ft. long by 25½ ft. broad, and 18¼ ft. deep, but this 703-ton vessel was despatched from Queenstown to New York under the command of Lieut. Roberts, R.N., on April 5, 1838, three days before her "rival," the *Great Western*. The *Sirius* was built by Menzies, of Leith, and engined by Wingate & Company, of Whiteinch, near Glasgow. The whole trip was one of great enterprise, and its successful termination a personal tribute to the courage and determination of her commander, whose fight with bad weather in an inadequate vessel was not lessened by mutiny which was only quelled by arms. She arrived in New York on April 24, after an eventful passage of 18½ days, during which she maintained an average speed of 8½ miles per hour on a consumption of about 24 tons of coal a day.

The *Great Western* left Bristol for New York on April 8, 1838, when the *Sirius* had already departed from Cork, and both vessels arrived at New York on the same day. The passage was made in 15 days, on an expenditure of 655 tons of coal, the average speed being just over 8 knots. At New York she had a tremendous reception, and had no lack of applicants for her accommodation, in spite of the fact that the fare was considered high, 30 guineas for the cabin, including wines and provisions, with an extra 20 guineas if the passenger desired a state room for himself, and an extra 30s. for steward's fee. She ran regularly for several summers, being laid up in the winter, and maintained an average of 15 days outwards and 13 homewards. There was no doubt about her success, but the company was disappointed when the Cunard Line got the mail contract, and in 1842 they offered her for sale. As she had cost £84,000, the owners were not satisfied with a bid of £40,000, and therefore returned her to service. Two years later the P. & O. Company agreed to purchase her for £32,000, insisting on new tubular boilers working at a pressure of about 12 lb. These gave a

certain amount of trouble, and finally the deal fell through. By that time the Great Western Company was tired of the matter, and there was a good deal of litigation before she went back to its service. At length she was sold to the Royal Mail Steam Packet Company in April, 1847, and ran between Southampton and the West Indies. On their service her average speed was rather less than eight knots, but it was ample for their purpose, and she was regarded as one of their best ships. Finally, at the end of 1856, she was sold to the shipbreakers and broken up at Vauxhall in the following year.

During this same period a third company entered the field in the form of the Transatlantic Steam Ship Company of Liverpool. It owed much to the energy of the lawyer and engineer, Charles Wye Williams, its first managing director, who was one of the founders of the City of Dublin Steam Packet Company. At the time of the formation of the Transatlantic company a fine vessel, known as the *Liverpool*, was being built for Sir John Tobin. This was purchased, and around her centred the hopes of the Liverpool promoters.

As the *Liverpool* was not ready for service, the



THE "GREAT WESTERN" LEAVING BRISTOL IN APRIL 1838, ON HER MAIDEN VOYAGE TO NEW YORK

[*Face page* 20

Face page 21]

An Interesting View of 1835 showing the Entrance to the Old Harbour at Bremerhaven, with the SS. *Weser* in the foreground.

Transatlantic company chartered the *Royal William* from their associates, the City of Dublin Steam Packet Company, and despatched her on July 5, 1838, from Liverpool to New York, where she arrived on July 24. She was the first steamer to leave the Mersey port on the Atlantic run. This vessel should not be confused with the Canadian-built ship of the same name which had crossed over some five years previously. The *Royal William* of 1838 was a vessel of 617 tons built at Liverpool by Wilson, and engined by Fawcett, Preston & Co. of the same town. She had a length of 175 ft., a breadth of 27 ft. Her propelling machinery was of the side-lever type, with cylinders of 48½ in. diameter and a stroke of 65 in., and developing about 270 horse-power. The paddle wheels were 24 ft. in diameter and propelled the vessel at approximately 10 knots. After making three return trips across the Atlantic she was returned to her owners, remaining in their possession, eventually as a coal hulk, until 1888, when she was sold for £11.

The *Liverpool* made her maiden voyage towards the end of 1838, leaving Liverpool on October 22, and reaching New York on November 23.

The lengthy journey is accounted for by the fact that she put into Queenstown on October 30 and only sailed thence on November 6. Queenstown was then known as the Cove of Cork, and it is interesting to note that in recent years, since the formation of the Irish Free State, the port has been officially renamed Cobh (pronounced Cove), thus restoring the ancient usage. The *Liverpool* was built by Humble & Milcrest on the Mersey and engined by George Forrester & Co. With a tonnage of 1,150, she was 223 ft. long by 30 ft. beam. The machinery was of 468 horse-power, with 75-in. cylinders and a piston stroke of 84 ins.

The vessel made five return voyages, which averaged 17 days out and 15 home, before being sold to the P. & O. Company. In their service she was renamed *Great Liverpool*, and finished her career by being wrecked on February 24, 1846, off Cape Finisterre, unfortunately with the loss of two lives.

At the risk of departing slightly from chronological sequence, one other ship is worthy of note here, namely the *Great Britain*, which had but a brief career on the North Atlantic, but

The Launch of Brunel's Famous Screw-steamer *Great Britain*, originally intended as a paddler. On trial she made a speed of 11 knots.

[*Face page* 22

followed this with an eventful life which has not yet finished, as she still survives as a hulk at Port Stanley, East Falkland.

When the *Great Britain* was laid down in Bristol, in 1839, it was considered that she was far too big a ship to be launched on the slips, so she was built in a specially constructed dock, after the fashion of most of the big men-of-war in Tudor and Georgian days. She was designed by Brunel, and his original intention was to make her a paddle ship and to name her *Mammoth*, but before she was completed the screw steamer *Archimedes* arrived at Bristol and made such an impression by her efficiency that it was decided to change her design to screw. Unfortunately the dock was not changed at the same time, so that when she was launched, on July 19, 1843, she could not get through the entrance and, accordingly, had to be held up until December, 1844, while it was altered. By this time her engines had been installed and she was ready for sea. Her iron hull had dimensions 289 ft. between perpendiculars, 322 ft. overall, by 50 ft. 6 in. extreme beam and 32 ft. 6 ins. depth of hold. It is interesting to note that, as no

contractor could be found willing to build such a big hull, her owners, the Great Western Steamship Company, had to construct it for themselves. Nasmith invented his steam hammer for the express purpose of forging her main shaft.

The *Great Britain* was fitted with a 4-cylinder engine, of 1,000 horse-power, with 88-in. cylinders and a stroke of 72 ins. The gearing between crankshaft and screw shaft consisted of a toothed drum 18 ft. in diameter and 38 ins. wide.

She was tried the day after she left the dock, when, with 16 revolutions per minute, she made a speed of 11 knots, although only half her boilers were working.

The *Great Britain* went round to London at an average speed of 9·6 knots, and in July, 1845, sailed to New York from Liverpool with 60 passengers and some 600 tons of cargo. Her passage was just over 15 days, giving an average speed of 9·25 knots. Shortly afterwards she put her six-bladed propeller out of action, and under sail proved a surprisingly smart ship.

In accordance with the practice of several steamship owners of that day, the *Great Britain* was regarded as being far too big and valuable to

trust to the hands of an ordinary mercantile marine master, with the result that a naval officer was always appointed to her command. In September, 1846, one of these, under the impression that he was on the other side of the Irish Sea, ran her ashore in Dundrum Bay. Brunel hurried across and built round her stern a palisade of heavy timber, which kept her safe until August, 1847, the manner in which her iron hull stood the strain doing much to make the reputation of iron ships. Her bottom was badly dented, however, and her engines and boilers were forced up out of their place, so it was anticipated that the repairs would be an expensive job. Her owners were not in a financial condition to face this expense, and accordingly they sold her for £24,000 —less than a quarter of what she had cost them only shortly before.

Her purchasers were Gibbs, Bright & Co., who were interested in the Australian trade. On this trade she did a number of smart voyages, but in 1874 it was decided to remove her machinery and run her as a three-masted sailing ship entirely.

After a number of passages to Australia, she put into Port Stanley in the Falkland Islands for

repairs after a buffeting that she had received off Cape Horn, and was there sold as a wool hulk. She is still to be seen there, fulfilling the same useful function, with intervals of coaling duties. When Admiral Sturdee took his battle cruisers out to defeat Von Spee, one of his ships obtained her coal from the old *Great Britain*, whose hull seems never likely to wear out.

We may fittingly conclude our chapter on the first attempts at regular services by a final reference to the *British Queen*, whose initial difficulties were solved by Napier completing her machinery installation. She sailed from Portsmouth on her maiden voyage on July 12, 1839. The vessel was of approximately 1,863 tons, with a length of 245 ft., and a breadth of 40½ ft.

Her owners brought out the *President*, in the following year, which after only two or three trips, left New York on March 11, 1841, and disappeared. This caused the final collapse of the British and American Steam Navigation Co., which was already in a precarious financial condition. The *British Queen* was sold in the same year to Belgian owners.

VOYAGES OF SAILING LINERS AND STEAMSHIPS 1839

	Average outward	Average homeward
Black Ball Line . .	33·17 days	22·12 days
Dramatic Line . .	30·12 days	20·12 days
Star Line . . .	36 days	24 days
Swallow Tail Line .	35 days	22·12 days
Great Western (steamship)	16·12 days	13·9 days
British Queen (steamship)	17·8 days	16·12 days
Liverpool (steamship) .	17·4 days	15·16 days
Averages: sailing liners	34·1 days	22·1 days
Averages: steamships .	17 days	15·4 days
Difference .	17·1 days	7·13 days

CHAPTER III

THE BIRTH OF THE CUNARD LINE

It was not until 1838 that the British Government decided that the steamship had become a sufficiently reliable form of transport for the carriage of the North American mails. In this year the Lords Commissioners of the Admiralty issued circulars inviting tenders for a steam packet service on the Atlantic. Not a single shipowner in Great Britain made an offer, and George Burns, destined later to be one of Cunard's associates, informed the comptroller of the Packet Service that he did not see his way clear to tackle such a large undertaking as the proposal of the Government involved. For a time it looked as if the plans would have to be abandoned, but a copy of the circular had reached Samuel Cunard, whose interest both in steamships and in the Atlantic run we have already seen in

The Pioneer Cunarder *Britannia* sailing from Boston Harbour on February 3, 1844, through the 7-mile canal cut in the ice by the merchants of Boston.

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"Consulting the Emigrant Agent in the late 'fifties."

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connection with his prominent shareholding in the *Royal William.*

The Government offer seemed to afford the right opportunity to launch a scheme in accordance with his ideals, and Cunard made strenuous efforts to interest both Halifax and Boston capitalists in his proposals. In both cases he was unsuccessful, and he, therefore, crossed the Atlantic in the *Liverpool* to seek capital for his enterprise in England. Here again things were by no means all plain sailing, and in London he met with such scant encouragement that he decided to try the Clyde with its famous associations of notable engineers and shipbuilders.

Some slight help was given by a letter of introduction from James Melville, secretary of the Honourable East India Company, to Robert Napier, the shipbuilder. This gentleman introduced him to George Burns, of the famous firm of J. & G. Burns (founded in 1818). Burns invited Cunard to dinner to meet his partner David MacIver. The latter gentleman at first showed considerable hesitation, but at a subsequent meeting the following day, Cunard's

convincing and successful advocacy secured the co-operation of both Burns and MacIver.

The requisite capital of £270,000 was raised within a very few days, mainly through the great influence of George Burns, and the British and North American Royal Mail Steam Packet Company was formed on May 4, 1839.

An offer had already been made to the British Government for the conveyance of the mails regularly every fortnight between Liverpool, Halifax, and Boston. This had been accepted, and the formal seven-year contract with Lord Melbourne's Government was signed by Samuel Cunard, George Burns, and David MacIver, the founders of the company. The conditions of the agreement stated that for the sum of £55,000 per annum Messrs. Cunard, Burns, and MacIver should supply three suitable steamers and perform two voyages per month. Subsequently four boats were required by the Admiralty, and the subsidy accordingly increased to about £81,000 per annum. An interesting stipulation was that the ships should be of sufficient strength to be used as troopships in case of necessity, and to be constructed to receive armaments.

That Cunard was the leading spirit is abundantly evident from the original contract for building the first three vessels for the company. This was signed on March 18, 1839, by Samuel Cunard and Robert Napier, in the presence of Hugh Moncrieff, and Robert Henderson, writers, of Glasgow.

This document, which may be fairly called historic, specified three good and sufficient steamships, not less than 200 feet long, equal in hull and machinery to the steamer *Commodore* or *London* constructed by the said Robert Napier, and equal to the *City of Glasgow*, as to the cabin fittings; one to be ready for trial and delivery on March 12, 1840, the second on April 13, 1840, and the third on May 1, 1840. James Cyrus Melville, secretary of the Honourable East India Company, was to be the referee for arbitration, in case of any differences, and the figure for the three vessels was to be £96,000 sterling.

An enthusiastic public meeting was held at Halifax immediately after receipt of the news of the success of their distinguished fellow townsman in closing the contract.

Actually the first Cunarder to cross the Atlantic was the *Unicorn*, a vessel which had previously been running on the Liverpool—Glasgow route, and was purchased by Cunard for the mail service between Halifax and Quebec. She was dispatched from Liverpool on May 16, 1840, and arrived in Halifax on May 30, where she caused a great stir in the city as the first visible evidence of the accomplishment of the great scheme. The *Unicorn* has no real place in the history of the Atlantic Ferry, however, as she made only the one westward crossing in course of being delivered for Canadian service. She was not intended to, and in fact never did, ply on the North Atlantic.

The pioneer vessel of the Cunard fleet was the famous *Britannia*, built at Port Glasgow by Robert Duncan & Co., and launched on February 5, 1840. The other ships of the original quartette were the *Acadia*, *Caledonia*, and *Columbia*. They were all wooden paddlers 207 ft. long, 34 ft. 4 ins. broad, and 22 ft. 6 ins. deep, with a gross tonnage of 1,154. The whole of the machinery was built and installed by Robert Napier, and consisted of two-cylinder engines of the side-lever type, having

72-in. cylinders and an 82-in. stroke. With a horse-power of up to 740, they drove paddles 28½ ft. in diameter and propelled the vessels at an average speed of 9 knots on a coal consumption of 38 tons per day. The cargo capacity was 225 tons, and there was accommodation for 115 cabin passengers.

The service was inaugurated on Saturday, July 4, 1840, the sixty-fourth anniversary of the Declaration of American Independence. The *Britannia* departed on her maiden voyage from Liverpool, amid much excitement, under the command of Captain Woodruff, and carrying Samuel Cunard.

Great was the enthusiasm in Halifax, when, early on the morning of July 17, it became known that the British and North American Royal Mail Steam Packet Company's R.M.S. *Britannia* had arrived during the night. The success of her initial voyage, her noble proportions, figurehead and name alike suggested a new era of progress in ocean transit, not only for that city, but for the whole North American seaboard. As described in the papers of that day, the scene was an inspiring one on the *Britannia's* departure from

Cunard's wharf, a few hours later, for Boston, as she steamed around the gaily decorated flagship to the booming of cannon, with every indication of popular rejoicing. The presence on board of the distinguished founder of the new order of things gave an added éclat to the occasion.

Cunard proceeded to Boston in the *Britannia*, where he was the recipient of ovations so numerous as to be almost embarrassing. The story of his 1,800 dinner invitations has often been told. At the great banquet tendered him 2,000 guests assembled under the chairmanship of Josiah Quincy, and Cunard was the lion of the hour.

Before many years were over Boston was to have an opportunity of showing her goodwill to the enterprise in a very practical way when the *Britannia* was frozen in at Boston harbour during the winter of 1843–4. There was a frost of unusual severity such as had not been known for more than half a century. The tide ran at the rate of four or five miles an hour, rising twelve feet, and causing the whole body of ice to be lifted and let down again twice every twenty-four hours. Notwithstanding this movement, the

surface remained unbroken except along the shore. When, on February 1, the *Britannia* was due to sail, it was found that the ice was 7 ft. thick in the wharf, and 2 ft. thick for a distance of seven miles out.

As soon as the merchants of Boston realised that the mail was imprisoned, a large sum of money was raised, and a seven-mile canal cut through the ice 100 ft. in width. The *Britannia* sailed out on February 3, 1844, only two days behind her time, and reached Liverpool in 15 days so that no alarm was occasioned by the delay. It is recorded that, when the British Post Office offered to defray the expense of cutting the canal, the citizens of Boston declined to accept the money.

It was with such a spirit of goodwill on both sides of the Atlantic that the Cunard Line started its career.

In these early days the question of the fastest run had scarcely been raised, at any rate within the fine limit with which it is now watched, and with the exception of the famous efforts of the *Sirius* and *Great Western* to reach New York first, little attention had been paid to exact hours and

minutes. As we have seen, the introduction of steam had cut the westward journey time in half and that was enough for most people.

On her maiden voyage, the *Britannia* had crossed from Liverpool to Halifax in 12 days and 10 hours at an average speed of $8\frac{1}{2}$ knots, and homeward from Halifax to Liverpool in August, 1840, in about 10 days even (just over $10\frac{1}{2}$ knots). The *Acadia* sailed from Liverpool on August 4 and cut the westward crossing to 11 days and 4 hours, while in July, 1841, she reduced it still further to 10 days and 22 hours, at which it remained for the rest of the decade. In September, 1842, this same vessel brought the eastbound journey down to 9 days and 15 hours and held that record for nearly five years until it was taken from her by the *Hibernia* in July, 1847, at 9 days $1\frac{1}{2}$ hours. The *Hibernia* was a somewhat larger vessel, being of 1,422 gross tons, and she made the first trip at over 11 knots average on this occasion, her approximate speed being, in fact, 11·67 knots, although the exact distance of these early crossings is not known.

Cunard's brilliant ability in surmounting difficulties was put to a severe test in 1846, when the

The First Arrival of the Ocean Steam Navigation Company's Steamship *Washington* at Bremerhaven on June 19, 1847.

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The *Hermann* of the Ocean Steam Navigation Company which was placed on the station in 1848.

original contract was about to expire, and the British Government announced its intention to renew it on a more extended scale. In the House of Commons on July 24, Mr. Miles moved a resolution favouring the Great Western Steamship Company's proposal to undertake the contract, contending that their steamers had brought the first news of the Canadian Rebellion and of the Oregon controversy.

It appeared, however, that the schedule of the Great Western Company "drew the line" at sailings in the winter months from November to April, while the Cunard Line offered a regular all-the-year-round service. The Cunard contract, further, provided for the equipment of their vessels for transport in the event of war.

The Chancellor of the Exchequer, successor to Sir Robert Peel, after giving a description of the circumstances connected with the granting of the contract to Cunard, said "he felt that that gentleman was the ablest person with whom the Government could have contracted for the conveyance of H.M. mails, but he was by no means opposed to the appointment of a committee which would

afford the House of Commons an opportunity of inquiring into the whole circumstances." Ultimately a committee was appointed and the result was a signal triumph for the Cunard Line on every point.

A letter from a friendly critic which appeared in *The Times* of August 15, 1846, fairly portrays public sentiment on the subject. After referring to the speed and regularity of the Cunard steamers and the excellence of their general appointments, this writer "feels confident that the community at large, with many private friends, will join in rejoicing at the successful issue of this select inquiry, and in the hope that Mr. Cunard should be permitted to enjoy for many years the fruits of his energetic enterprise, the contract for which with the Government is certain to be carried out by him to the full letter, as he has invariably acted in every other most honourably."

After the completion of the new contract in 1847 further vessels were placed in the Cunard fleet, namely the *America*, *Niagara*, *Canada*, and *Europa* in 1848, and the *Asia* and *Africa* in 1850. The 1848 batch were each of about 1,825 tons and 1,400 horse-power, and had a speed of 10¼

knots, but none of them reduced the times of their predecessors. The 1850 twins had a gross tonnage of 2,226, and steamed at $12\frac{1}{4}$ knots, burning 76 tons per day. In May, 1850, the *Asia* lowered the Liverpool to Halifax record to 8 days and 17 hours at a speed of about 12·12 knots, and this was the figure at which it stood when American competition came along. Henceforward Halifax disappears from the "Blue Riband," and is replaced by the direct New York times.

Having seen how the efforts of Samuel Cunard were successful in inaugurating the first steamship service across the Atlantic, it is interesting to consider what manner of man it was that started a new era in ocean navigation. The Cunard family were Quakers, who emigrated to Philadelphia, Pa., in the seventeenth century, and settled in that hardy colony of William Penn's followers which produced so many outstanding characters, not the least of whom were the fathers of American independence. Following the secession of the American colonies and the War of Independence, Abraham Cunard went to Halifax, Nova Scotia, and it was here that his

famous son, Samuel, was born on November 21, 1787.

As a Royalist who elected to relinquish his Pennsylvanian connections and begin again in territory which remained within the Empire, Abraham Cunard had many struggles and anxieties, despite securing an appointment in the Halifax Dockyard shortly after his arrival. Samuel, therefore, had little opportunity to take advantage of the restricted educational facilities then available, and was, like many other famous and successful men, largely self-taught.

In his early teens, he became an employee in the engineer department of the Halifax lumber-yard where his zeal and activity gained favourable notice from the officials.

The attractions of a business career soon led him to leave this yard in order to assist in the foundation of the firm of Abraham Cunard & Son before he became of age. He undertook his first important contract when only twenty-seven years old, this being the conveyance by sailing vessels of H.M. mails between Halifax and Newfoundland, Boston and Bermuda. This service was undertaken at his own financial risk and was

carried out to the entire satisfaction of the British Government.

In the years following the conclusion of peace with the United States, Halifax experienced a very severe slump, as much of its activity had centred around the provisions necessary for the war. In 1819, the dockyard was removed to Bermuda. Throughout these changes, Cunard's enterprises continued to progress, and eventually he had no less than forty vessels under his control. In 1814 Cunard married Miss Susan Duffus, daughter of John Duffus, a prominent Halifax business man.

Following the death of Abraham Cunard, the style of the firm was changed to S. Cunard and Company, and such was the success of the many and diverse maritime efforts of its head that, at forty years of age, Cunard was estimated to be worth at least £200,000.

We have already noticed that Cunard headed the list of subscribers to the *Royal William* which was built at Quebec originally for service between that town and Halifax. When it was decided to send her to Gravesend in 1833, her performance of 17 days between Pictou and the Isle of Wight

doubtless convinced Cunard of the soundness and practicability of the views which he had long held that the future of the Atlantic ferry lay in steam navigation. We have already seen how he eventually overcame all obstacles both moral and financial, and laid the foundation of that one pioneer transatlantic company which is with us to this day.

In 1846 he was elected a Fellow of the Royal Geographical Society, and not long afterwards removed with his family to live permanently in London, leaving his son, William, in charge of his business affairs in Canada. Queen Victoria, in 1859, conferred upon him the dignity of a baronetcy of the United Kingdom in recognition of his distinguished services to the State. He acquired a fine estate at Bush Hill, Edmonton, then twelve miles out of London, and also established a town mansion at Queen's Gate Gardens.

Sir Samuel spent the remaining years of his life in London, where he rapidly became both prominent and esteemed. Not infrequently he was the trusted counsellor and adviser to some of the leading lights of his day on important matters

pertaining to maritime interests. He died on April 20, 1865, at the age of seventy-eight.

George Burns, who was associated with Samuel Cunard in the formation of the Cunard Line, was born near Glasgow in 1795. In partnership with his brother, James, he started business as a general merchant in that city in 1818. Some six years later he acquired a sailing fleet of coasting vessels trading to Liverpool, and also formed a line of steamers to Belfast. When steam was substituted on the Liverpool service the firm co-operated with D. & C. MacIver. George Burns was one of the joint signatories to the first Admiralty mail contract. As he lived in Glasgow he represented the interests of the Cunard Line there in addition to his extensive coasting business until his retirement in 1860. He then went to live at Wemyss Bay, where he died on June 2, 1890, at the age of ninety-five. He was created a baronet in May, 1889, just over a year before his death.

David MacIver, the third signatory to the first Admiralty mail contract, was also a Scotsman by birth, this event taking place in 1807. He received his early business experience in the office of

the American consul at Greenock. Subsequently he founded the Liverpool firm of D. & C. MacIver in conjunction with his younger brother, Charles. This company handled the Liverpool end of the Cunard business. David MacIver died in 1845 at the early age of thirty-eight.

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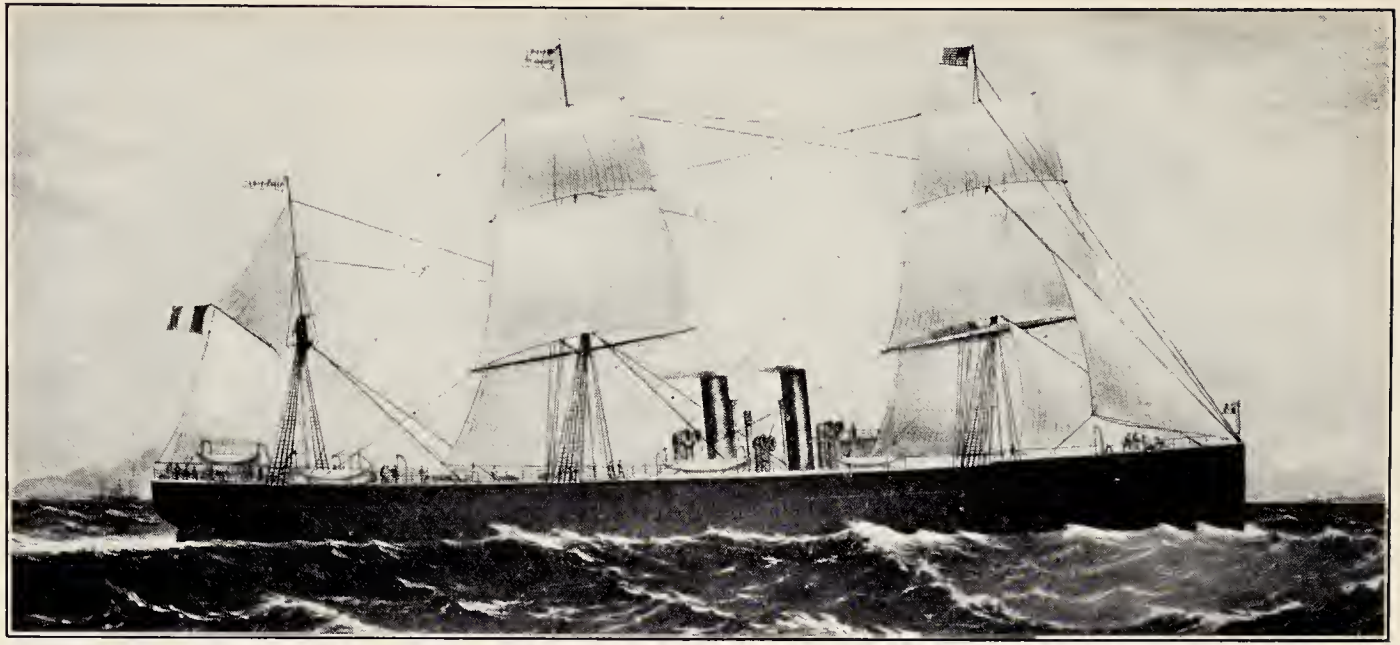

THE "LAFAYETTE"

Built at Greenock for the C.G.T. by Scott in 1863. She had a gross tonnage of 3,003. The same name has now been given to a 21,000-ton motorship which was launched in May, 1929, from the St. Nazaire Yard.

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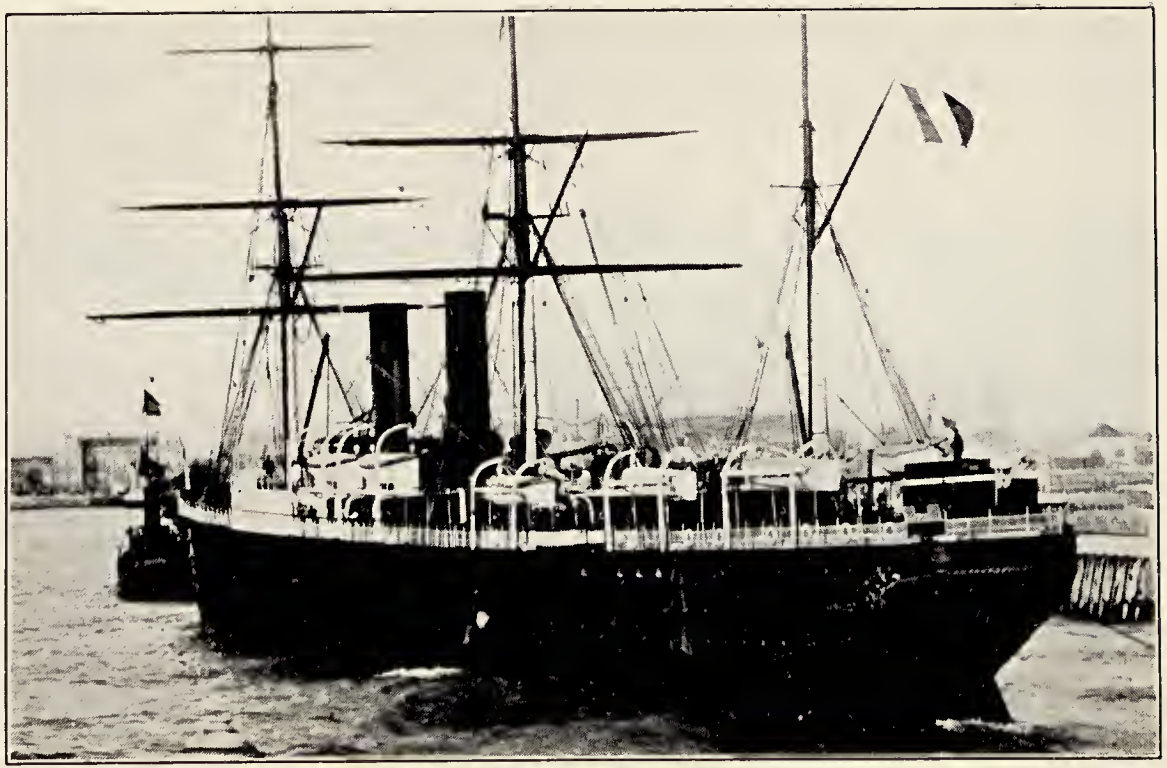

THE "AMÉRIQUE" OF 3,200 TONS

Built for the Cie. Gle. Transatlantique in 1864 by the Chantier et Ateliers de Saint Nazaire Penhoët. Originally named *Impératrice Eugénie*, she was the first passenger ship launched from this yard. The C.G.T. commenced to run from Havre to New York in 1862 with British-built iron vessels.

CHAPTER IV

AMERICAN COMPETITION AND THE FORMATION OF THE COLLINS LINE

Considering that America had occupied a supreme position on the Atlantic, and that American-built clippers had deservedly won a world-wide reputation, it is not surprising that American pride was hurt by the monopoly held by Great Britain in the early days of transatlantic steamship services. Congress was therefore asked to provide a subsidy for a line between Liverpool and New York, flying the American flag. Congress agreed to this and their action brought into existence the famous, but ill-fated, Collins Line, which made the greatest stir on the Atlantic that has ever taken place under the American flag.

Mr. E. K. Collins, who founded the line in 1846, had already had considerable experience

in the management of one of the crack lines of sailing packets on the Western Ocean, but he believed in steam, and planned to give his new company the best tonnage available. Four splendid wooden steamships were obtained, respectively the *Atlantic*, *Arctic*, *Baltic* and *Pacific*, all of which measured 282 ft. in length, 45 ft. beam, and 31½ ft. deep, with a tonnage of 2,860. These fine vessels were built by William Brain, of New York, and were a great advance upon the then-existing Cunarders. They were the first ships to have straight stems and to be fitted with smoking rooms specially set apart for the purpose. Other luxuries included spacious bathrooms and barbers' shops, and on one or two of the vessels the saloons were placed amidships. The hull, although undoubtedly ugly, with its high freeboard, straight stem and heavy counter stern, was the finest that the American wooden shipbuilders could produce, and their reputation at that time was second to none.

One of the features in which the owners took great pride was called the annunciator, which was nothing but a very simple form of indicator for the cabin bells. The *Atlantic* also carried what

appears to have been the first engine-room telegraph, which was the great feature of interest when she was thrown open to visitors at Liverpool for the benefit of the Institution for the Blind.

The engine-room was fitted with a long box with five compartments, each having a wire leading up to the bridge and ending in a panel fixed to the side of the paddle-box like bell pulls. This provided for five signals—ahead, slow, fast, back, and hook-on, but there was no repeating device from the engineers. It was elementary enough, but until then communication in the best steamers had been maintained by very inefficient voice pipes, and in most by a boy stationed within hearing of the bridge who shouted the orders down the engine-room skylight. Steam heating was another popular innovation, this being carried even into the steerage quarters.

The engines were the principal problem, for American engineers had no experience in such machinery, so Collins first obtained from Sewell and Faron, who acted as consulting engineers for the United States Navy, a complete machinery design by the latter gentleman, who

afterwards became chief engineer of the Collins Line.

He planned engines with cylinders 90 ins. in diameter by 108 ins. stroke, but his partner, Mr. Sewell, disagreed with him and maintained that 95-in. cylinders were necessary in order to beat the contemporary Cunarders.

The contracts were actually placed with New York firms when Collins began to have doubts as to the cylinders, and with considerable difficulty persuaded the U.S. Navy to permit Faron to visit Britain and study the latest marine engines there. He travelled home in the Cunard *Niagara*, a crack ship of that time, and discovered that instead of the 10 lb. per sq. in. pressure which was understood to be her maximum, she was actually working with 13 lb. per sq. in. The construction of the engines was immediately stopped—one of the things that added considerably to the cost of the ships—and it was finally agreed that she should have cylinders with a diameter of 96 ins. and a stroke of 120 ins. although many American authorities considered that the change was quite unnecessary and the expenditure uncalled for.

The machinery for the *Atlantic* and *Arctic* was constructed by the Novelty Ironworks, of New York, and that of the *Baltic* and *Pacific* by the Atlantic Works, also of New York. In all cases it consisted of two-cylinder side-lever type engines with solid cast-iron beams, having cylinders 96 ins. in diameter and a stroke of 120 ins. Many British features were introduced, but American practice was followed in the steam and exhaust valves, which were on the balanced poppet system.

Steam was supplied by four iron tubular boilers, the shell plates being $\frac{3}{4}$ in. thick. Each boiler was 22 ft. long and 14 ft. 3 ins. high, two of them being 14 ft. wide and two of them 15 ft. wide. The tubes were vertical and each boiler had two rows of furnaces, one above the other, the steam pressure being 17 lb. to the sq. in.

With paddles $35\frac{1}{2}$ ft. in diameter, the *Atlantic* and her three sisters contrived an average speed of about 12 knots, burning 85 tons of coal per day in order to obtain it.

No expense was spared in either hull or machinery, which made the cost of the

ships very much more than had been at first estimated, and had not the U.S. Government come to the assistance of the company by increasing the promised subsidy, it is doubtful whether the whole four vessels could have been built.

The first sailing of the Collins Line took place on April 27, 1849, when the *Atlantic* was dispatched from New York for Liverpool. From the start, this vessel and her sisters attracted numerous passengers, and succeeded in their object of outstripping the best performances of the Cunard liners. They were never a paying proposition, however, and the then-head of the Cunard Line hit the position off aptly when he described their efforts as "breaking the Cunard windows with sovereigns."

In 1851 the *Atlantic* was given up as lost owing to the fact that she broke her paddle shaft when half-way across the Atlantic and had to sail back to Cork. Opportunity was taken during the subsequent extensive repairs to improve her accommodation, a new dining saloon being added on deck.

In September, 1854, the Collins Line received its first serious blow in the series of unfortunate events which characterised its brief history. In that month the *Arctic* was run into by a small French steamer named the *Vesta* off Cape Race in a dense fog, and sunk with a loss of 322 lives, among whom were the wife, son and daughter of Collins himself.

Within less than two years the line suffered another disaster in the loss of the *Pacific*, which sailed from Liverpool on June 29, 1856, and was lost at sea, no subsequent news of her precise fate ever being received.

The *Adriatic*, the last of the great wooden paddle steamers brought out by the Collins Line, arrived in Liverpool in December, 1857. She was built by Steers, of New York, and was by far the finest and fastest vessel constructed up to that date. She had a length of 355 ft., a beam of 50 ft., and a depth of 33 ft., with a gross tonnage of 3,670. The propelling machinery, which was built at the Novelty Ironworks, New York, consisted of two oscillating cylinders, of 100 ins. diameter, and 144 ins. stroke. These were days of low boiler pressures, and that used on the

Adriatic was only 20 lb. per sq. in. The I.H.P. of the installation was 3,600. The paddles were 40 ft. in diameter and at 17 r.p.m. gave a speed of 13 knots on a daily consumption of 85 to 90 tons.

As has already been indicated, the cost of maintaining the service was prohibitive, and when the U.S. Government suddenly withdrew its subsidy, the Collins Line collapsed in January, 1858.

The subsequent fate of these three vessels is interesting, and rounds off the story of America's first attempt to challenge the supremacy of British shipping on the North Atlantic route. Both the *Atlantic* and *Baltic* were converted to sailing ships, and as such rendered some further years' useful work afloat. For a considerable time the *Atlantic* lay in New York Harbour and eventually was broken up at Cold Spring, N.Y., in 1871.

The *Adriatic* was laid up for a time, after the collapse of the line, and was then sold to be put in a service from Galway, Ireland, which was promoted in 1858. The line was unsuccessful, and she was again laid up in Birkenhead, and

Two paddle steamers, *Hansa* and *Germania*, which were worked between Bremen and New York for a short time in the early 'fifties.

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THE "BREMEN" OF 1858

afterwards sold to serve as a hulk on the west coast of Africa.

E. K. Collins was born in Truro, Mass., on August 5, 1802. He started his business career in New York City at the age of fifteen, and subsequently joined a firm of West Indian merchants on whose vessels he served as purser. In association with his father, he spent some years, commencing 1822, in a general shipping and commission business, eventually becoming head of the company.

Among his more notable shipping activities, was the placing in commission of some fine full-rigged sailing vessels on the run from New York to Mexico and the West Indies, and later, in 1836, the formation of the Dramatic Line, a famous service of sailing packets between New York and Liverpool, which received its name from the fact that its fleet was composed of ships named after famous theatrical personages, such as Shakespeare and Garrick. Collins worked hard for some years endeavouring to induce the United States Government to assist in promoting a line of American-built and owned steamers. Although his efforts were for a time unsuccessful, they were

the primary cause of the passing of an Act of Congress in 1847 which enabled him to form the Collins Line of steamships. Collins died in New York in January, 1878, exactly twenty years after the collapse of his notable enterprise.

CHAPTER V

GERMANY'S ENTRY

FOLLOWING the successful establishment of the Cunard Line, England was the only country which was in a position to forward her mail direct to America by fast steamer. The German postal officials were compelled, by commercial considerations, to send their mails via England, as the fastest sailing ships were taking about 27 days as against the 14 by the Cunarders. In both Germany and America considerable national feeling arose at the necessity of depending on a British line for the transport of the mails.

The United States took the initiative by inviting tenders for the service, and on June 15, 1846, the American Senate accepted the contract which had been drawn up on the previous February 2 between the Postmaster-General and an American

contractor, named Mills, who had brought forward the least expensive offer. According to this contract, Mills was to receive a subsidy of $400,000 for placing four steamers into the service.

The European terminus was fixed at Bremen, but the contractor was to have the option of sailing to Havre instead on alternate voyages. Bremen, at that time a town of only 50,000 inhabitants, was eventually selected, after practically every other important continental port had been considered, largely owing to the strenuous efforts of her merchants in furthering the scheme, headed by the mayor, Johann Smidt, and the senator, Arnold Duckwitz, who worked closely with Col. D. A. Man, the American consul in Bremen.

The contract was to run for five years from March 1, 1847, the steamers sailing once every two months from each terminal until August 1, 1847, once monthly thence, until March 1, 1848, when the full schedule was to be introduced which called for two sailings a month between April and November, and once a month from December to March. One of the stipulations

was that the vessels were to make the journey at least as quickly as the Cunarders.

Mills found considerable difficulty in raising the necessary capital to put through his scheme, and with the consent of the American Government formed a company called the Ocean Steam Navigation Company, of which he became president. Through the instrumentality of the Bremen party, the requisite finance was eventually secured, and Bremen thus made her entry into the transatlantic steamship business. This early connection was directly responsible for the subsequent formation of the Norddeutscher Lloyd, and, incidentally, laid the foundation for the later prominence of the port.

In the meantime, the building of the first two vessels for the new line, named respectively *Washington* and *Hermann*, had been commenced. The *Washington* was launched on January 30, 1847, amid considerable rejoicing. She was larger than the Cunarder, being 75 metres in length, 12 metres in breadth (excluding paddle box), and 9·5 metres in depth, with a displacement of 2,632 tons. Provision was made for both first and second-class passengers, the vessel

carrying 112 of the former and 70 of the latter. The single fares were fixed at $120 first-class from New York and $150 from Bremen, which was a considerable reduction on the first-class fare of $190 charged by the Cunard Line. The *Washington's* engines developed 2,000 horse-power and gave her a speed of just over 15 knots.

Following a successful trial trip on May 25 and 26, she left New York Harbour on her maiden voyage on June 2, 1847. On the 15th she lay off Cowes, and on the 19th at 6.30 a.m. dropped anchor at Bremerhaven, on the Weser, after a 17-days voyage. She was accorded a great welcome despite the early hour, and a salute of cannon notified the whole port that the link with the New World had been successfully forged. By 11 a.m. the mail had been carried to Bremen by express riders and was forwarded thence two and a half hours later. The passengers arrived in Bremen at 3 p.m. on the Weser steamer *Gutenberg* which was gaily decorated for the occasion.

The *Hermann* made her trial trip from New York on March 21, 1848. The two vessels had

cost altogether $579,000 and the funds of the company were exhausted. It was not found possible to issue further shares in America, and consequently money was lacking with which to build the remaining two steamers required by the contract. The help of Bremen was again sought, but the German revolution of 1848 prevented anything being forthcoming from this course.

In 1852, despite the endeavours of competing lines, the Ocean Company secured a renewal of the mail contract for five years, and the company enjoyed a short period of prosperity, paying a dividend of from 7 to 10 per cent., but on June 1, 1857, the American postal authorities failed to renew owing to receiving more favourable offers from other owners. The loss of the annual subsidy of $100,000 a vessel sealed the fate of the company, and as the Norddeutscher Lloyd was then being formed, Bremen had no further interest in the ocean venture. Liquidation therefore followed, and the *Washington* and *Hermann* were sold on June 17, 1858, for $46,000.

While, in many respects, the undertaking was a failure, the main purpose of the promoters had

been splendidly achieved, namely, the establishment of a direct German transatlantic connection. The port of Bremen had come to the front, and its passenger traffic had more than doubled in a decade. The dredging of the Weser had made progress, the construction of the railway from Bremen to Hanover had been hastened (it was opened on December 12, 1847), and Bremerhaven had been adequately equipped as a harbour for ocean-going steamers. When, therefore, Bremen merchants resolved to found their own transatlantic line, the trail was already blazed for their later enterprise and the experience which the Ocean Steam Navigation Company had gained had taught their successors what to do and what not to do to attain better results.

In 1851 Senator Arnold Duckwitz, whose association with the Ocean Company we have already noticed, made an attempt, following the example of Trieste, to form a Weser Lloyd, and to secure some of those ships of Admiral Brommy's first war fleet, which were capable of being converted into merchant ships. Bremen approved of the plan but the times were not propitious for raising the money, especially as there was then a

THE TYNE-BUILT STEAMSHIP "HUDSON"
Which entered the Norddeutscher Lloyd Atlantic Service in August, 1858.

[*Face page 60*

[Face page 61]

THE "GREAT EASTERN"

distinct aversion towards joint stock companies, also many sound reasons were advanced against buying old war vessels for the use of a new company. Two Bremen firms, however, W. A. Fritze & Company and Carl Lehmkuhl, bought the two paddle steamers *Hansa* and *Germania* from Brommy's fleet, and had them reconstructed at great cost, but they were only in service between Bremen and New York for a very short time. The vessels failed to fulfil expectations, and were withdrawn on being chartered in 1854 for the transport of English troops to the Crimea.

It was during this period that the famous Hamburg–Amerika Line gradually adopted steam. This powerful company, trading from Hamburg and Cuxhaven to New York, via Southampton, started in this service with sailing vessels in 1847. Their first steamer, was the *Borussia*, an iron-screw vessel of 2,349 tons, built and engined by Caird & Company, of Greenock, in 1855. She was 317¾ ft. long, with a beam of 40 ft., and a depth of 28 ft. She had overhead oscillating geared machinery with cylinders each 67 ins. in diameter having a stroke of 72 ins. The *Borussia* commenced her first voyage on June 1, 1856, and

was followed by a sister ship called the *Hammonia*. These two vessels maintained the service in conjunction with sailing ships until 1860 when the sailing vessels were disposed of and the fleet augmented by additional steamers.

CHAPTER VI

FROM PADDLE TO SCREW

With the formation of the Collins Line, the Cunard's undisputed reign was at an end, and, although some of the competitors which sprang up about this period were not immediate aspirants for "Blue Riband" honours, the Cunard fully realised that the kudos of making the fastest passage would attract them in due course.

New York was established as the chief American port of call for the Cunard fleet in 1848, although the service to Boston was not discontinued. When the Collins sailings started in the following spring we have already seen that they beat the best Cunard performances, though at prohibitive cost.

In 1851 the Collins liner *Baltic* established the following times against the Cunarder *Africa*:

	Baltic	*Africa*
Liverpool–New York	9 dys. 13 hrs.	10 dys. 6 hrs.
New York–Liverpool	10 d. 4 h. 45 m.	10 d. 5 h. 35 m.

On the eastward run there was very little in it, but the westward showed an advantage to the American line of nearly one knot in average speed. Through the period of competition all the honours went to the Collins boats.

The Cunarder *Arabia*, which was built in 1852 was not a record breaker in the speed sense, but she deserves mention as the last of the wooden ships in the fleet. Up to this point each successive addition to the Cunard Line had been built of wood, had been a paddle steamer, and although incorporating minor improvements, had been no radical departure from the *Britannia*. In 1856 the company's first iron steamship, the *Persia*, was put upon the station with the avowed intention of "maintaining the supremacy now being contested by other lines." She was built and engined by Robert Napier & Co., of Glasgow, and was considerably longer than her predecessors, being 360 ft. long, by 45 ft. broad, with a gross tonnage of 3,300. Her paddle wheels were 40 ft. in diameter and gave her a speed of 13 knots. The use of iron for her hull gave a great impetus to the iron industry of this country by opening up what was virtually a new era in ship construction.

Another change was the passing of the paddler and the coming of the screw vessel. The *Scotia*, of 1862, was the last of the Cunard paddle steamers. Like the *Persia*, she was built and engined by Robert Napier & Co., but was a larger ship, being of 3,871 gross tons.

The Cunard Line were, however, by no means the pioneers of screw steamers on the North Atlantic, for, apart from the *Great Britain* already noticed, the Inman Line had used screw-driven ships as early as 1850. These will be reviewed subsequently, in another chapter.

The *China* is a particularly interesting vessel on the Atlantic Ferry as being the first screw mail steamer owned by the Cunard. At the end of 1860 the line announced that they had ordered a screw steamer from Napier, of Glasgow, to replace the *Etna*, and also a large paddle steamer, which was famous as the *Scotia*. The Cunard Company had been hard hit by the competition of the Inman Line, which caused them to give the screw propeller a trial, although they were loath to leave the paddle. As the trial between the two ships resulted in the Cunard modernising its fleet, a comparison of their details is interesting

	China	*Scotia*
Propulsion . .	Screw	Paddle
Ship dimensions, ft.	326 × 40½ × 27½	379 × 47¾ × 30½
Gross tonnage .	2,529	3,871
Engines . .	Geared oscillating	Side lever
Cylinders . .	80¼ in. × 66 in.	100 in. × 144 in.
I.H.P. . .	2,250	4,900
Steam pressure .	22 lb. per sq. in.	25 lb. per sq. in.
Coal consumption, tons per day .	82	164
Lb. per I.H.P. per hour . .	3·4	3·65
Bunkers, tons .	1,100	1,800
Sea speed, knots .	13·9	14
Passengers .	160 first, 771 third	300 first, —
Cargo, tons . .	1,050	1,400

The geared oscillating engines of the *China* had two 80¼ in. cylinders with a 66 in. stroke and were designed to develop an indicated horse-power of 2,250 at sea, giving her a service speed of 13 knots, and in practice she proved an excellent steamer. These oscillating engines were fitted with surface condensers, but, as they were then regarded with a good deal of suspicion by marine engineers, jet condensers were also fitted as reserve in case the former failed. Steam was supplied by

four box-type tubular boilers, working at a pressure of 22 lb. per sq. in., with 24 furnaces, a grate area of 432 sq. ft. and a heating surface of 11,920 sq. ft. Her coal consumption was 82 tons per day at full speed, which worked out at, roughly, 3·4 lb. per I.H.P. per hour.

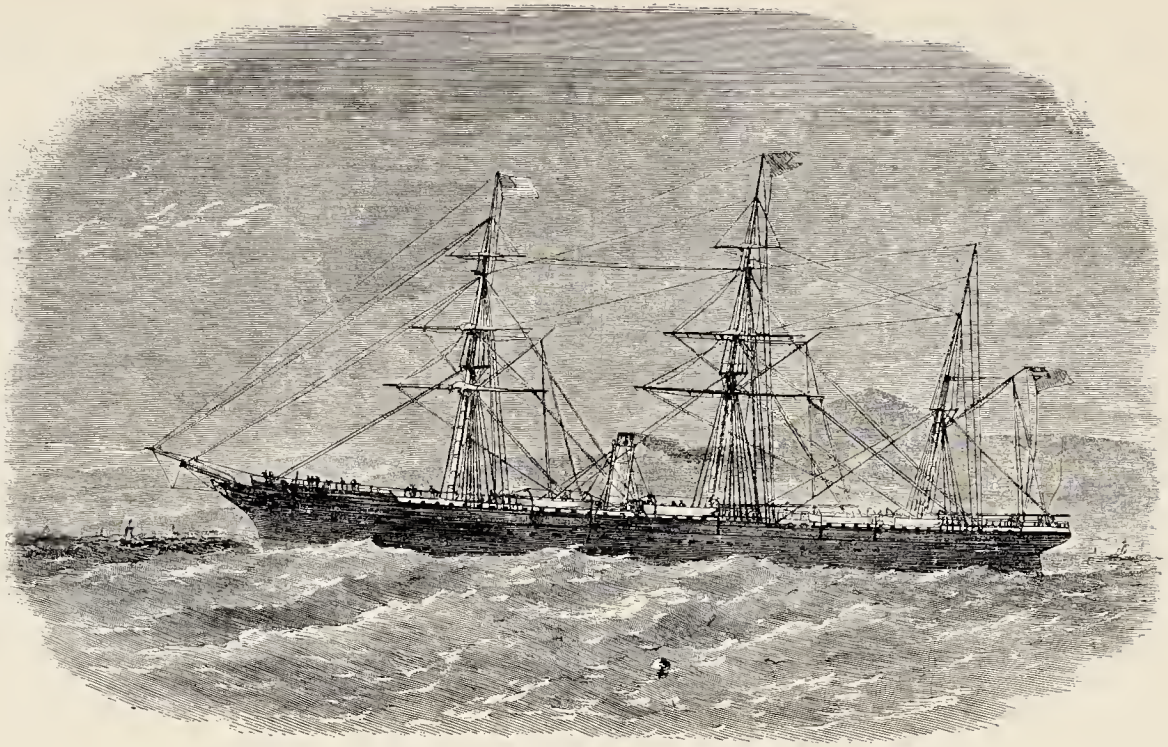
The *China* was designed to carry 160 cabin and 771 steerage passengers, but in wartime her 'tween-decks could be converted for the accommodation of 1,500 troops. Until then the Cunard Company had not been interested in the third-class service, which was afterwards to give them the greater part of their profits.

The *China* did not run official trials on the Clyde, but her time round to the Mersey in February, 1862, was carefully checked, and worked out at a speed of 14 knots, with excellent economy. Her first captain was James Anderson, one of the best-known masters in the Cunard service, and under him she made some excellent passages, although her first voyage was marred by her intermediate shaft breaking in the worst of weather, 26 hours after she had left New York. She was under sail for four days, until her engineers contrived to patch up the shaft, the total passage

being 14 days 23 hours 25 minutes, as against her usual 9 days.

As she got older, the *China* became faster, and was known as the fastest screw steamer on the North Atlantic. In 1867 she rescued the crew of twelve of the barque *Achilles*, and in the following year cut down the Liverpool pilot cutter in bad weather and drowned several of the pilots. In 1872 a cracked cylinder forced her to put back to Queenstown, and three months afterwards, while on passage to Glasgow for repairs, she stranded in the Clyde. Opportunity was taken of these repairs to give her new engines and boilers by Barclay Curle & Co., two-cylinder compound engines with cylinders 51 and 86 in. by 48 in. stroke, working at 62 lb. per sq. in. pressure being fitted. No efforts were made to make her any faster, although considerable economy of fuel was effected.

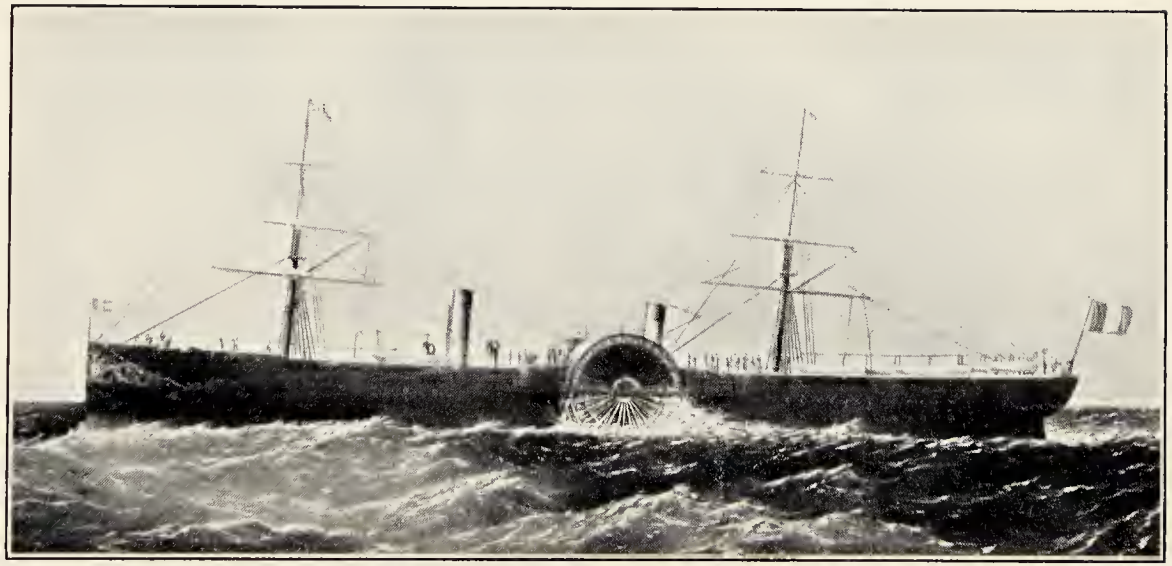
In March, 1878, she took her last sailing for the Cunard and was then laid up, but in the following year she was chartered by the Government to take troops out to South Africa, where the Zulu War was in progress. During this passage, the pin of her capstan broke, while she was weighing



THE CUNARDER "CHINA" OF 1862

She was the first screw-propelled mail steamer of this line.

[*Face page 68*]



One of the last large paddle steamers built for the Atlantic ferry. The C.G.T. Liner, *Napoleon III*, which was launched in 1866, from the Thames Ironworks, Blackwall, is shown here as a paddler. She was afterwards converted to screw propulsion.

anchor, with the result that two men were killed and seventeen injured. In 1880 she was sold to the Spaniards, and re-named *Magallenes*, being re-sold in 1889 to Bischoff, of Vegesack, who converted her into a four-masted barque and re-named her *Theodor*. She changed hands in Germany in 1899, and in 1901 was sold to Johanson, of Christiania. In March, 1906, she left Tampa for Yokohama with a cargo of phosphates, and was lost in circumstances that have never been cleared up.

Mention has already been made of the promotion of the Galway Line in connection with their purchase of the *Adriatic* after the collapse of the Collins enterprise. Galway has attracted attention for many years as the nearest point of Europe to the United States, but to date no great success has attended any of the efforts to develop it as a terminus for a fast Atlantic service. As a result this interesting Irish town, which in the Middle Ages was a sort of Liverpool, with tall ships trading to Spain, made great preparations for the prosperity which the Atlantic ships were to bring back. There is a colossal square with Imperial, Royal, and American hotels, an enormous railway

station, and general facilities far in excess of any prosperity which has visited the town or is apparently ever likely to—the whole constituting one more tragedy in that fair land of smiles and tears.

The Galway Line was officially the Atlantic Royal Mail Company, floated in 1858, and which ordered two steamers from Palmer Bros. & Co., of Jarrow, now Palmers Shipbuilding & Iron Co. Ltd. These were the first really big ships that company built. The name of one of them was to have been *Leinster*, but before she was completed this was changed to *Hibernia*.

An iron paddle steamer of 2,959 gross tons on dimensions 360 ft. by 40 ft. by 29·3 ft. depth of hold, the *Hibernia* had a straight stem and flush deck, with a funnel either side of the paddle. In that day a heavy rig was usual on the North Atlantic, but the full purpose of the Galway Line was to run a very fast service, and accordingly the ships only had light steadying sails on two masts. This saving in weight extended to the hull, and the *Hibernia* soon showed such structural weakness that she had to be taken out of commission for a while and strengthened.

The original plans were to give accommodation for 200 saloon and 300 third-class passengers, but this was changed, and she was completed with quarters for 96 first and 504 third class passengers, in addition to a crew of 126.

The engines were also altered during construction, the original scheme being to have a three-cylinder oscillating-cylinder set by R. & W. Hawthorn, with 75 in. cylinders. The cylinders were, however, actually bored to 80 ins. The engines were supplied with steam by eight tubular boilers, each having five furnaces, with a total heating surface of 20,000 sq. ft. Beardmore & Galloway's patent superheaters were fitted to the boilers, but from the outset they were inefficient and unreliable. The *Hibernia* was launched at Jarrow on September 1, 1860, with engines and boilers in position and the vessel nominally practically ready for sea, but another six months elapsed before she was tried in Stokes Bay. The company's mail subsidy contract called for a minimum speed of 17½ knots, but on trial, although she was comparatively light and only drew 16 ft. 4 ins. of water, she could not contrive more than 14½ knots with 3,500 I.H.P., the engines running

at 22 r.p.m. and the steam pressure being 23 lb. per sq. in. and the vacuum 25 ins. of mercury.

None of the Galway Line ships was delivered to contract time, and the *Connaught* was lost almost immediately, so that there was talk of cancelling the subsidy contract altogether and transferring the service to the Allan Line. However, Parliament took a lenient view, and the *Hibernia* was sent round to recommence the service under the command of Captain N. Prowse, who had been chief officer of the famous *Great Eastern*. The directors of the company invited a large party of guests to join the ship at Southampton for the passage round to Galway, but she met a gale and was so much strained that the pumps were quite unable to keep her clear of water, and she had to put into Cork in a very serious condition, afterwards being sent to Liverpool for repairs. This was rather too much for the patience of the Government, and the contract was cancelled, while the authorities interested themselves in the condition of the ship, and found when she was docked by Laird of Birkenhead, that all the rivets of her keel and bottom plating for 150 ft. amidships had strained badly, and it was estimated that she

would require £30,000 spent on her before she was fit for sea. It was freely said that the actual expenditure was nearly double this sum.

Lord Palmerston still favoured the company, and announced that he would renew the contract if they could put their fleet and finances into a sound condition. Accordingly, the *Hibernia* left Galway on August 18, 1863, on the first sailing under the new contract, carrying 190 passengers and mails. She took 12 days to reach Boston, and the service collapsed almost immediately afterwards, the ships being mortgaged with Overend, Gurney & Co., the bankers, whose eventual failure ruined so many other shipowners.

For some years afterwards the *Hibernia* was laid up at Birkenhead, but in 1869 she was purchased by E. Bates & Co., of Liverpool, who took out the paddle engines and replaced them by twin screws driven by compound inverted engines, having cylinders 36 and 60 ins. in diameter by 39 in. stroke. As soon as the Suez Canal was opened she was put on the Eastern service from Liverpool, but in 1872 was purchased by the Telegraph Construction & Maintenance Company, of London, who converted

her into a cable steamer. On November 22, 1877, while carrying 560 miles of cable to replace the Para–Mavanham Line, which had broken, she anchored in the latter port, but swung round with the tide and stranded. All efforts to move her were unavailing, and only 75 miles of the cable could be saved before she broke up.

Brunel's activities were all characterised by size and bold conception, and therefore he was the man whom one would naturally look to for the largest vessel of her day, and also one introducing many novelties in construction and propulsion. Following on his earlier incursions into ship-building, such as the *Great Western* and *Great Britain*, he brought into being one of the greatest engineering ventures of the Victorian era when he built the *Great Eastern*. She was the first large steamship to be built of iron and to have a screw propeller, while she also vindicated such new and much criticised constructional principles as longitudinal framing, the cellular double bottom, and the sub-division of the hull by bulkheads. As she was commercially a failure it has long been the custom to speak of her as an all-round

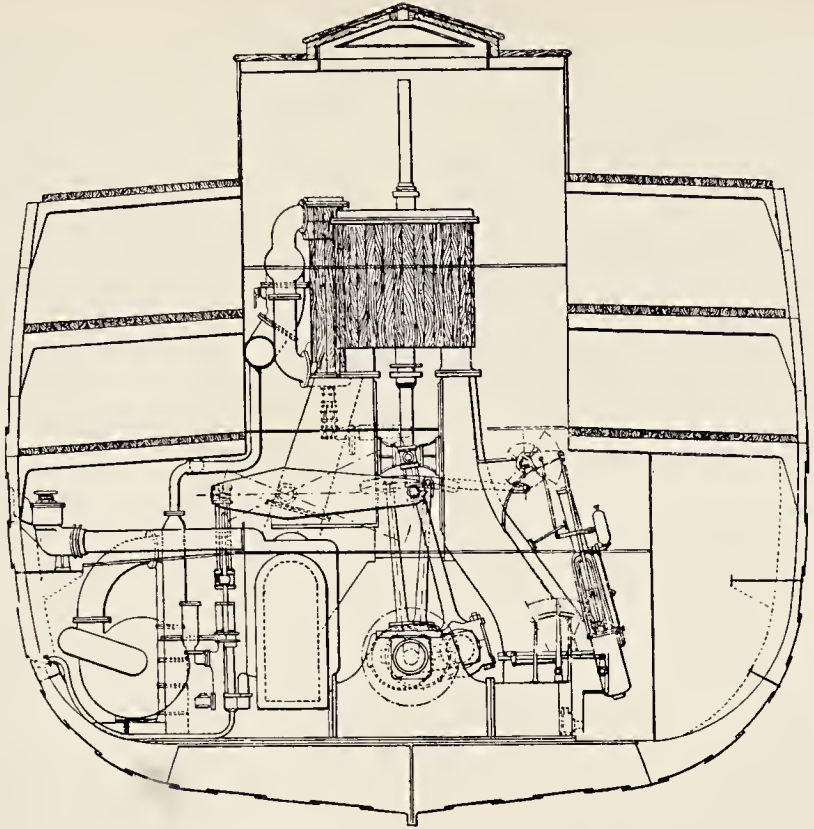
failure, whereas it is probable that she would have fulfilled all expectations had she been used for the long Eastern service for which she was designed. Her first owners were the Eastern Steam Navigation Company who ordered the vessel from Scott, Russell & Co., of Millwall. She was 680 ft. long, by 83 ft. wide (118 ft. over the paddle boxes), by 57 ft. 6 ins. deep, with a gross tonnage of 24,360, and was, therefore, far and away the largest ship afloat; indeed it was not until the closing years of the century that the White Star liner *Oceanic* exceeded her in size, and by that time the *Great Eastern* had been broken up, so that she retained her pre-eminence in size throughout her career.

After many difficulties in building, the great vessel was ready for launching in November, 1857. Lack of width and depth in the Thames had necessitated her being built broadside-on to the river and some fault in the unusual launching ways resulted in a failure at the first attempt to launch her on November 3. It was not until January 31, 1858, that the ship was finally floated, and altogether the cost of launching reached the colossal figure of £60,000. For

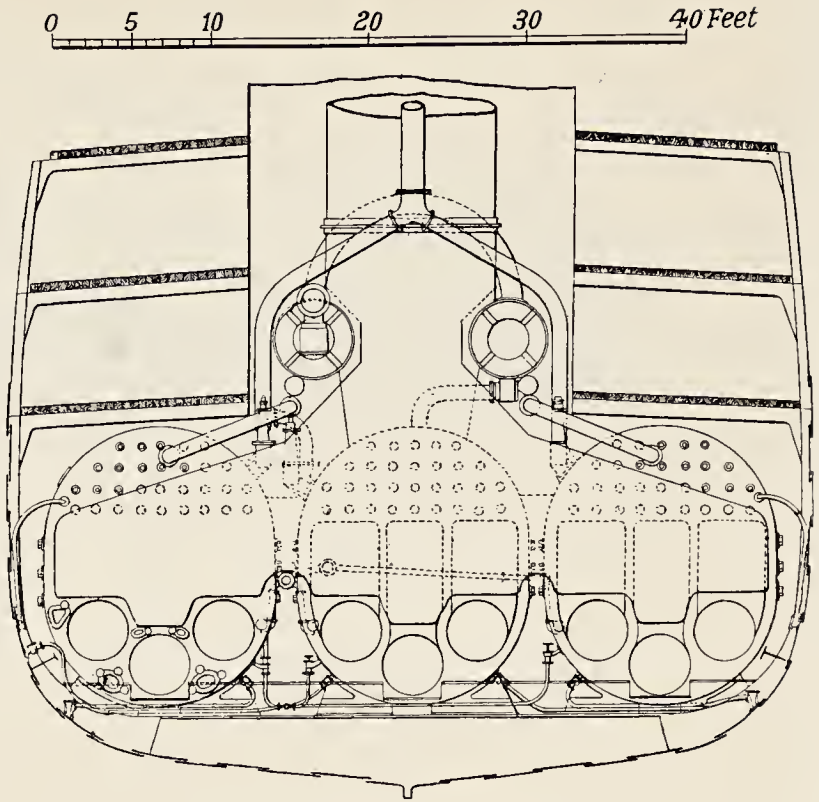
a year and a half she lay in the Thames as her owners had been practically ruined by delays and accidents, and were unable to complete the fitting-out.

Finally she was finished, but the idea of Eastern trade was abandoned, and the *Great Eastern* was dispatched for America on September 7, 1859, anchoring that night off Woolwich and the following night off the Nore. On September 9, when off Hastings, an explosion occurred on board, killing seven persons and injuring many more. The result of this accident was to bring the trip to a sudden end at Weymouth. Brunel died on September 15, having seen his great steamship afloat, but pursued by misfortune.

The succeeding winter and spring was spent in repairs, and at length, on June 17, 1860, she sailed from Southampton for America, making the journey in 11 days. During the remainder of 1860 and throughout 1861 she continued to ply on the North Atlantic without lowering any records or performing any remarkable feats, and, indeed, the large quantity of bunker coal, 10,000 tons, for which special provision had been made



Section through the engine-room of the Cunarder *Servia*.



The six double-ended boilers were arranged three abreast.

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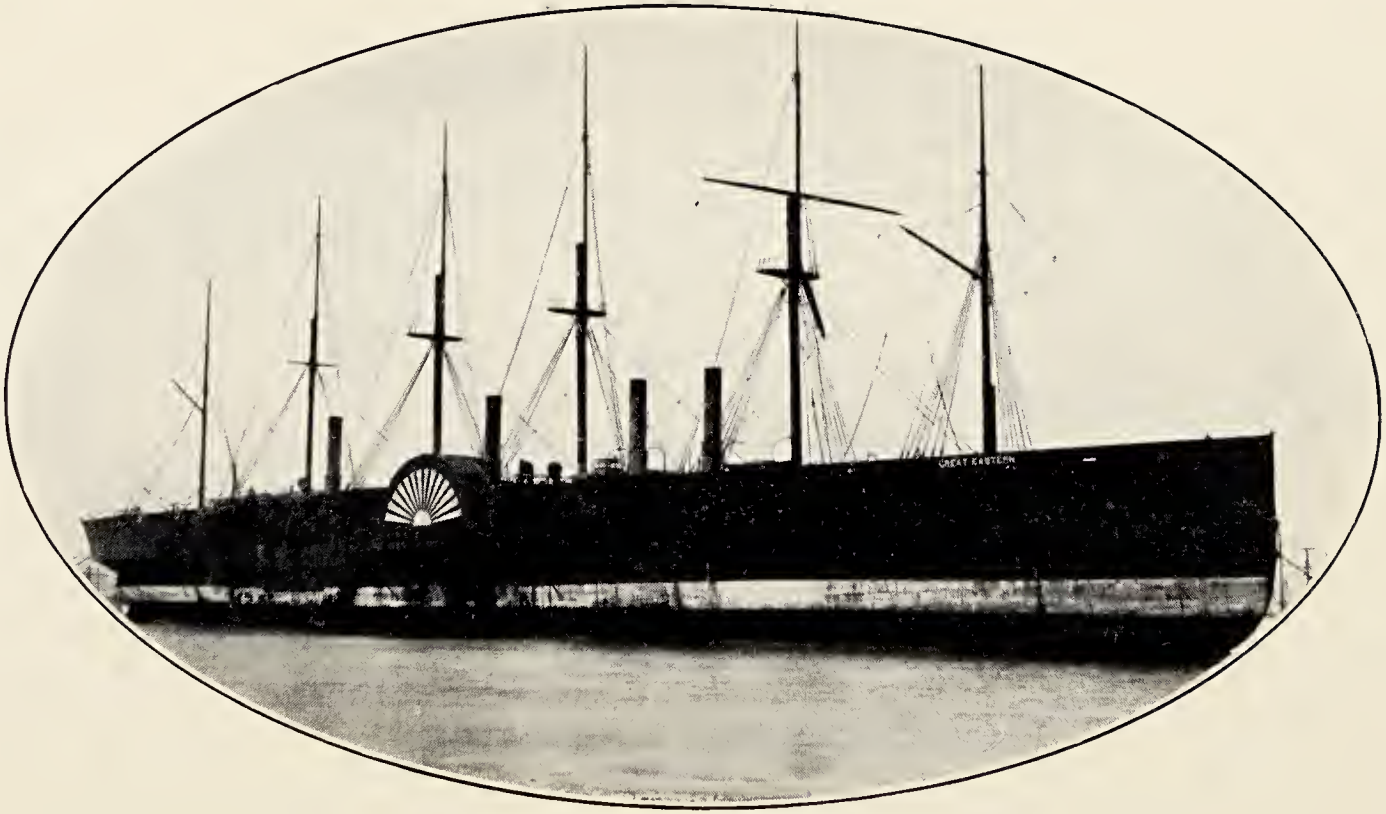


BRUNEL'S FAMOUS SHIP, "GREAT EASTERN"

Was built in 1858 by J. Scott Russell at Millwall. She was the only vessel that, throughout her entire career, retained the honour of being the largest vessel afloat.

in view of her intended Eastern service, proved a drawback on the short Atlantic run.

Towards the latter part of 1861 the *Great Eastern* encountered a severe storm when about 300 miles west of the Irish coast and her paddle boxes were swept away and the steering gear put out of action. It was but another episode in her continued bad luck that this should have occurred when she was carrying her best load of passengers and freight. Three months later, in December, she found suitable employment in carrying 2,000 troops to Canada rapidly and easily, when political difficulties were anticipated.

After over two years of casual chartering, the ship was sold by auction without reserve, in February, 1864, and realised only £25,000—about *one-thirtieth* of the original cost. Apart from laying the first Atlantic cable, most of her subsequent career was spent lying-up and she was last in steam in 1875. In her last years she suffered the indignity of having advertisements placed along her sides and in her capacity as an advertising medium caused both amusement and annoyance in the ports. Finally she was successfully beached near New Ferry, on the Cheshire

side of the Mersey, for breaking up towards the end of August, 1888. Her final price to the shipbreakers was £16,000.

The propelling machinery of the *Great Eastern* was most interesting and unusual, being a combination of paddle and screw, and probably the greatest mistake in her equipment was the adoption of this hybrid engine installation. The paddle machinery was built by Scott, Russell & Co. and had four oscillating cylinders 74 ins. in diameter, with a stroke of 168 ins. Each cylinder weighed 26 tons and worked at a pressure of 25 lb. per sq. in. Steam was supplied by four boilers, each weighing 50 tons when empty, built to Brunel's design. Each boiler had ten furnaces and 400 tubes, the tubes being 5 ft. 6 ins. long by 3 ins. in diameter. The original paddles were 58 ft. in diameter with 30 floats to each wheel. The floats at first were 13 ft. long and 3 ft. wide, but were subsequently replaced by narrower and more satisfactory ones. The screw engines were built by James Watt & Co., of Birmingham, and had four horizontal cylinders of 84 in. diameter and 48 in. stroke. The screw was four-bladed, and made of cast iron, being 24 ft. in diameter.

It turned at a maximum of 43 revolutions a minute.

The vessel's speed is usually reckoned at about 14·5 knots. The screw alone was capable of driving her at 9 knots under favourable conditions, burning 260 tons of fuel a day. On one occasion the ship is reported to have done 16 knots under paddle and screw combined, but her average good performance was nearer 13 knots.

CHAPTER VII

NORDDEUTSCHER LLOYD

In the opening years of the eighteen-fifties the vessels trading between Bremen and North America were quite inadequate to handle the rapidly-increasing emigrant traffic, and a contemporary newspaper stated that it was quite painful to see the goods pile up and the passengers arriving and no ships there in time to forward them. H. H. Meier was the most influential of Bremen's merchant princes during this decade, and at his instigation the Bremen merchants got to work and formed a committee "for the founding of a large company to carry on shipping between New York and Bremen in place of the Ocean Steam Navigation Company and to connect Bremen with European ports."

Without following in detail the many difficulties experienced and overcome during the period of

organisation, the result was that the Norddeutscher Lloyd was incorporated as a joint-stock company on February 20, 1857, very closely upon the plan drafted by Meier. The new concern took over and combined four existing businesses, namely:

Weser Hunte Dampfschiffahrts Gesellschaft.
Gesellschaft für Schleppschiffahrt auf der Unterweser.
Dampfschleppschiff-Gesellschaft für die Oberweser.
Allgemeine Assecuranz Anstalt für die Oberweser.

The most difficult and trying part of the work which H. H. Meier had undertaken was to procure the necessary capital. A Government subsidy such as the Ocean Steam Navigation Company had enjoyed, and as was given by the English Government to the Cunard Line, was not expected and, moreover, was not forthcoming. Meier had to depend on private sources, and after about six months' negotiation with different banking houses, succeeded in January, 1857, in making a contract with the Credit Anstalt für Industrie und Handel in Dessau, whereby he

received one and a half million taler. Meier was strangely opposed to the practice of granting special privileges to banking undertakings which acquired large blocks of shares, but an exception was made in the case of the Dessau Bank, inasmuch as they were given the New York agency of the Line. It was not until 1861 when, on the outbreak of the American Civil War, the New York branch failed, that the agency was transferred to Oelrichs & Company.

The Norddeutscher Lloyd was thus successfully floated, and it was the Company's proud boast that it had been formed without any help from the Government. In 1857 the Lloyd opened its first line, namely, to England, It was not possible to commence the transatlantic service until suitable vessels had been built. Contracts were placed for four ships, two being entrusted to Caird & Company, Greenock, and two to Palmers Shipbuilding & Iron Company, Newcastle. The Clyde-built steamers were named *Bremen* and *New York*, while those under construction on the Tyne, were called *Hudson* and *Weser*.

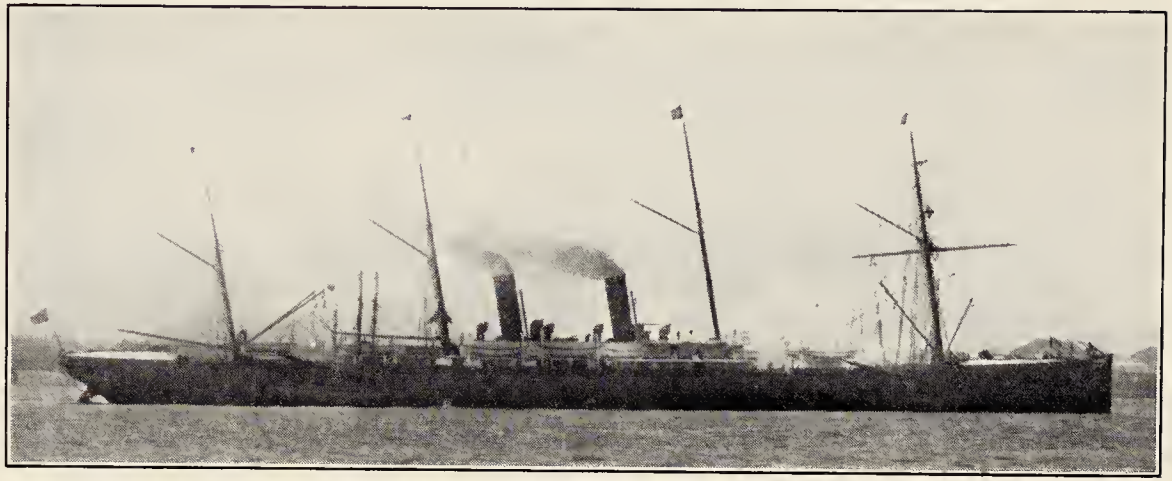
The long anticipated North Atlantic service, for which the trade and industry of Bremen and

its hinterland had worked so hard, was announced on April 26, 1858, and by the middle of June, the *Bremen* was out on the Bremerhaven roads ready to commence her trial trip. She was a screw steamer, 334 ft. long, 42 ft. broad, and a depth of about 26 ft. She had a capacity of 850 tons of coal and 1,000 tons of freight. Her propelling machinery consisted of inverted direct-acting engines, having cylinders 90 ins. in diameter with a 42 in. stroke, giving an I.H.P. of approximately 2,500. Following a trial trip, which extended to the Hoheweg Lighthouse, and was conducted with much ceremony, the *Bremen* started on her maiden voyage to New York on June 19. Owing to stormy weather the voyage lasted a good 14 days, and the vessel arrived safely in New York at 7 o'clock on the morning of July 4, when an Independence Day celebration was held on board by some 450 Americans and Germans.

Before the end of the year, the *Hudson*, *Weser*, and *New York* had entered the service, and the Norddeutscher Lloyd started regular fortnightly services. Very few months were to pass, however, before the Line struck a patch of bad luck. To

begin with, the *Hudson*, which had been built at a cost of 360,000 taler, and had only gone on the station in August, 1858, was partially destroyed by fire in Bremerhaven on the night of November 2. The wreck was sold to Newcastle. Then the *Weser*, while *en route* to New York in December of the same year, suffered such severe storm damages that she was compelled to return to Queenstown. The damages were found to be so extensive that it would have been uneconomic to repair her, and she also was sold out of the service. As a final blow, the crankshaft of the *Bremen* broke in the early days of 1859 and this vessel was laid up in dry dock for six months. With only the *New York* remaining, regular sailings were impossible. In 1860 an order for a new steamer, the *Hansa*, was placed in England, and in 1861, the *America* followed, thus replenishing the quartette; 1860 also saw the signing of the first contracts with both England and the States for mail carrying, an occurrence which materially strengthened the standing of the Lloyd, while in December, 1861, after long and difficult negotiations, an agreement was finally reached with the Hamburg–Amerika Line on questions of sailing

THE "CITY OF BERLIN"
Built in 1875 by Caird & Co., Greenock, for the Inman Line.



THE GUION LINER "ARIZONA"
Built at Fairfield in 1879, was the first ship to average 16 knots across the Atlantic.

[*Face page* 84

"La Normandie"

Was built by the Barrow Shipbuilding Company in 1882, being one of the few large liners to be built in this country for the Cie. Gle. Transatlantique. She had six-cylinder engines, corresponding to those of the famous Inman Liner, *City of Rome*.

dates and rates. The *America*, made her first trip to New York on May 23, 1863.

Germany thus became firmly established on the North Atlantic, but her chief passenger traffic was of the emigrant class, and two decades were to pass before she made her entry into the express service, while it was not until the close of the century that the Norddeutscher Lloyd carried the coveted Atlantic honours to the shores of the Fatherland.

CHAPTER VIII

THE INMAN LINE

The year 1850 saw the unpretentious beginnings of a line which was afterwards destined to occupy a foremost place on the Atlantic Ferry, and for a quarter of a century to prove the most serious rival of the Cunard Line for the Blue Riband. The service in question was founded by William Inman, of Liverpool, in conjunction with Richardson, Bros. & Company of that city, the original idea being to trade between Philadelphia and Liverpool. The first steamers of the Inman Line were the *City of Glasgow* and *City of Manchester;* the former of these vessels was built as the first of a fleet intended to trade between Glasgow and New York, and actually sailed in this service, but the scheme was never completed, and the ship passed into the hands of the Inman Line and inaugurated their service by her first

sailing from Liverpool for Philadelphia on December 11, 1850.

Both vessels were constructed of iron, and were built on the Clyde by Tod & McGregor. They were 258 ft. in length, 34¼ ft. beam and 25 ft. deep. Engines of 350 horse-power were built by the same firm, and had cylinders 71 ins. in diameter, with a stroke of 60 ins. Steam was supplied by three boilers having nine furnaces, the boiler pressure being 10 lb. per sq. in. Many years were to pass before the Inman Line came into the record-breaking class, so far as speed was concerned, but in putting these two vessels on the North Atlantic, they at least took the lead with the introduction of screw-driven vessels; the two ships in question each having a two-bladed propeller.

In 1856 the Inman Line commenced sailing to New York with the *City of Washington*, and as this proved a more suitable port for their trade, Philadelphia was given up. During the following year the *City of Baltimore* started calling at Queenstown, the first sailing from here on May 12, establishing the Irish town as a regular port of call on the North Atlantic run.

With a service from Queenstown to New York the Inman Line was brought into direct competition with the Cunard Company, and in the latter part of the 'sixties, succeeding in wresting the Atlantic honours with their first *City of Paris.*

When the Inman Line steamers commenced running in the early 'fifties, they improved the standard of design of iron screw steamers on the North Atlantic very rapidly, but it was not until the first *City of Paris* was built that the company made any great effort to break records or to cater for the saloon trade. This vessel was built and engined at Glasgow in 1866, and excited great public interest. The Cunarder *Russia*, was her immediate rival, but in November, 1867, the *City of Paris* won the westbound record with a passage from Queenstown to New York of 8 days 4 hours 1 minute, which record lasted for nearly five years.

Like nearly all the early Inman Line steamers, the *City of Paris* was built by Tod & McGregor, of Glasgow. She was an iron screw ship with full sail power, her dimensions being 358·7 ft. by 40·4 ft. by 26·2 ft. depth

of hold, which gave her a gross tonnage of 2,556. She had what was regarded as a high freeboard, the hurricane deck being 17 ft. above the water-line at load draught. Among other innovations, she was steered from the fore bridge, after the American fashion, and was the first important ship under the British flag to be given this feature.

The horizontal engines were of the trunk type, with cylinders 82 ins. in diameter by 42 in. stroke. They developed an indicated horse-power of 2,800, and were supplied with steam by six flat-sided multi-tubular boilers with twenty-four furnaces, working at a pressure of 30 lb. per sq. in. She was a fast ship, maintaining 15 knots on her passage down from the Clyde to Liverpool, but she consumed 100 tons of coal per day in the most favourable circumstances.

On her third voyage, in 1866, she won the outward Blue Riband from the Cunard liner *Scotia*, with a time of 8 days 11 hours 40 minutes, but soon improved this with a crossing of 8 days 4 hours 1 minute, which was a record by four hours. In August, 1869, carrying the Duke of Connaught out to Halifax, the *City of Paris* made

a record passage to that port of 6 days 21 hours 30 minutes.

In 1870 she was taken back to the Clyde and lengthened, her new dimensions being 397·7 ft. by 40·4 ft. by 26·2 ft. depth of hold, with a new tonnage of 3,081. In the following year she raced the new White Star liner *Oceanic* home, and beat her by four hours, although when the latter ship had been sent back to her builders' yard and certain alterations had been carried out, she was by far the faster of the two steamers.

In February, 1873, while homeward bound, the *City of Paris* picked up her consort, the *City of Brussels*, in mid-Atlantic, the latter ship having lost her rudder and rudder post. She was taken in tow for Queenstown, while the purser of the *City of Paris* was transhipped to an Allan liner to get home as quickly as possible and report the accident. As it was, he only arrived a few hours ahead of his ship.

In 1879 the *City of Paris* was commissioned as a transport for the Zulu War, and although she made a very fast outward passage, had the misfortune to strand on a rock at the entrance to

Simon's Bay and sustained severe damage. The troops were transhipped to another vessel and the ship was paid off immediately.

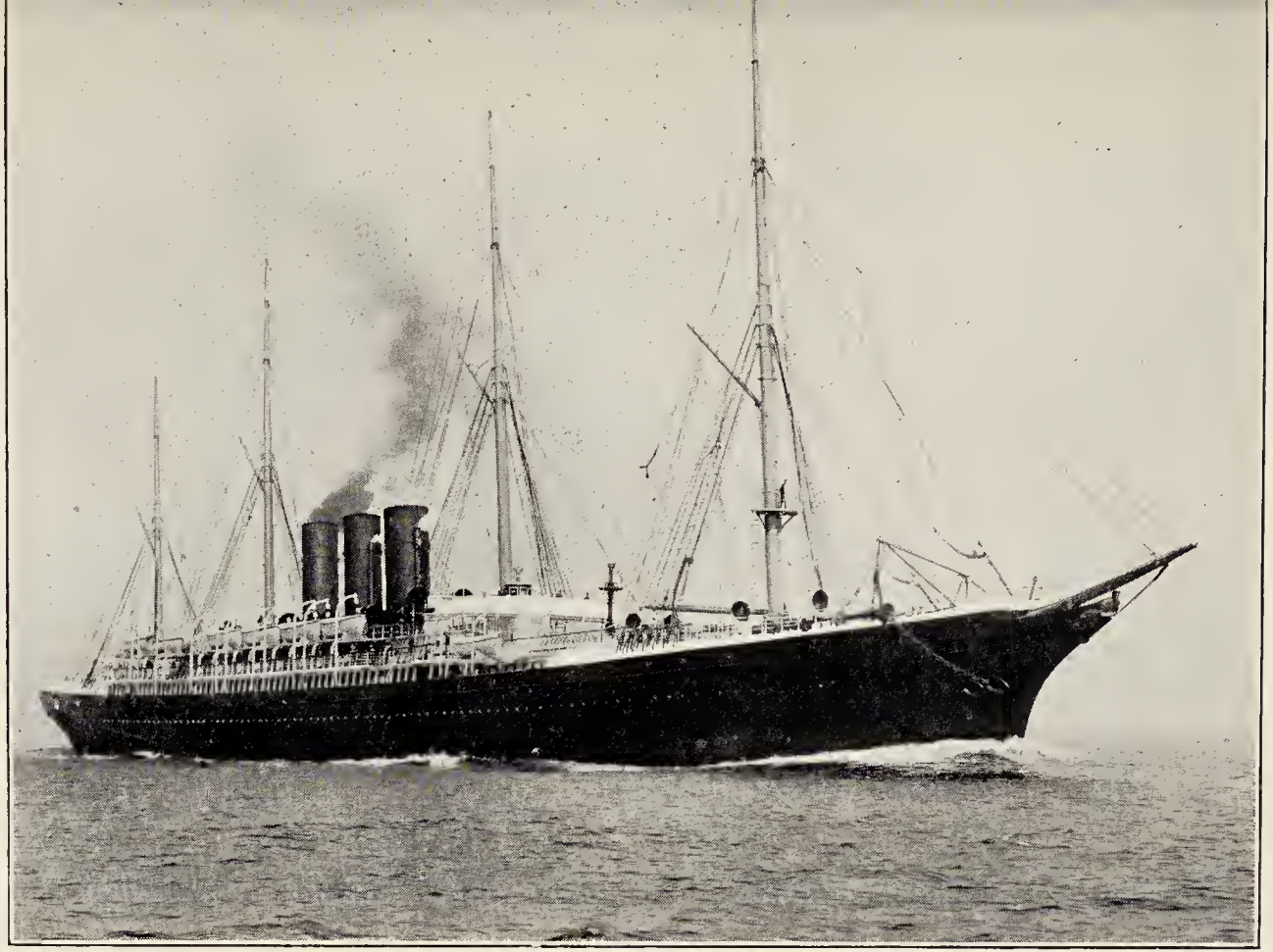
In 1889 her owners decided to fit new engines and boilers by George Forrester & Co., of Liverpool, two-cylinder compound inverted machines with cylinder dimensions 44½ and 84 in. by 60 in. stroke, working at a pressure of 80 lb., being installed. Soon afterwards the ship was taken up as a transport for the Egyptian War, and in the latter part of 1883 she made her last sailing under the Inman flag. In the following February the *City of Paris* was transferred to French owners and re-named *Tonquin*, but in March, 1885, while on passage from Cardiff to Marseilles with coal, preparatory to taking troops out to French China, she came into collision with another French steamer in a fog off Malaga, and was sunk with a loss of 24 lives.

The *City of Brussels*, which was the second great Inman liner of this period, was also built by Tod & McGregor, who launched her in 1869. She was 390 ft. long, 40¼ ft. broad, and 27 ft. deep, with a tonnage of 3,747. The engines were of the horizontal direct-acting surface-condensing

trunk type, each having two cylinders of 91½ in. diameter and a 48 in. stroke. They worked at a pressure of 30 lb., and propelled the vessel at a speed of nearly 13 knots on a fuel consumption of 110 tons per day.

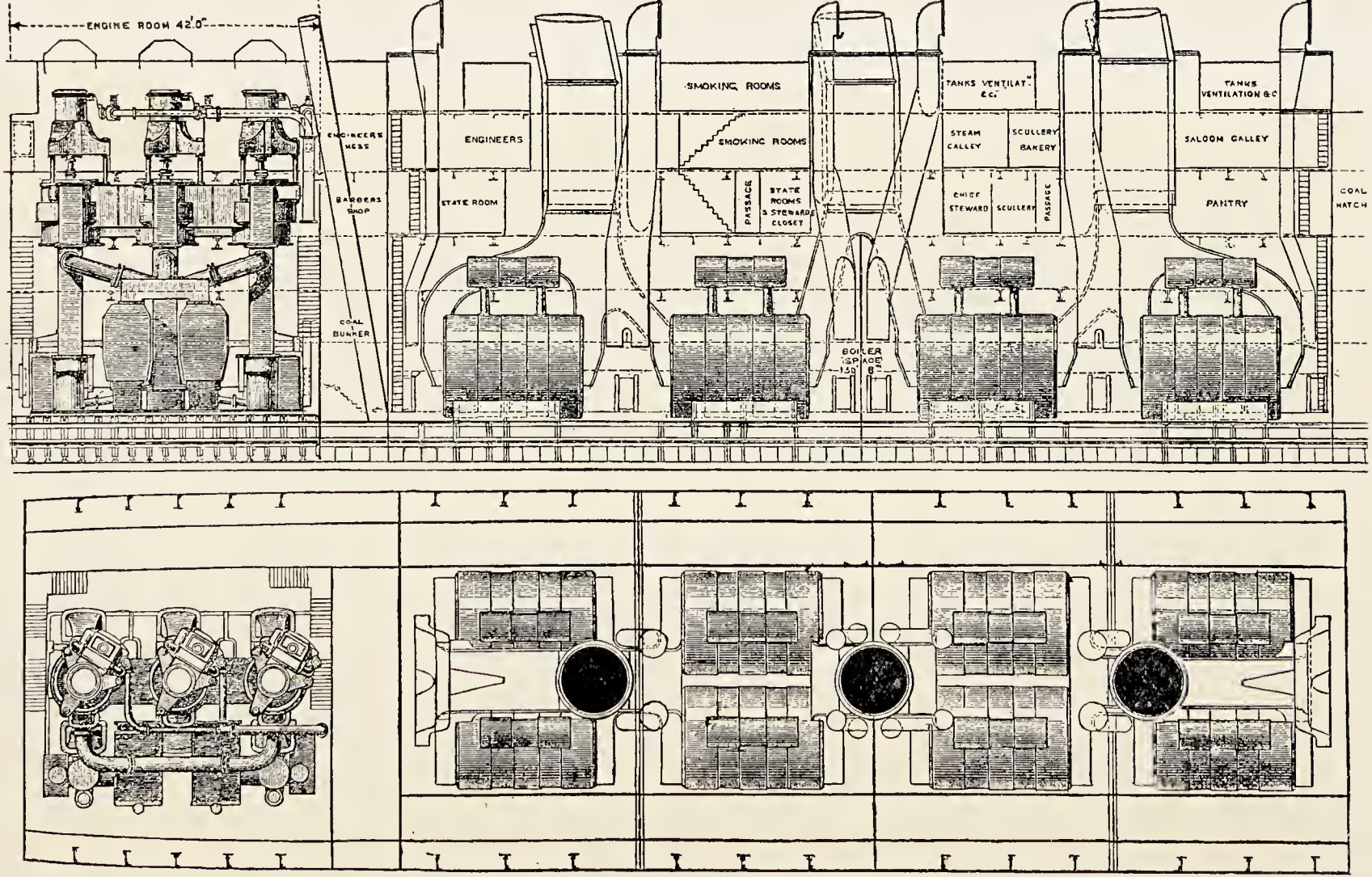
The *City of Paris* and *City of Brussels* between them captured and held both eastward and westward records for the Inman Line until in the early 'seventies the White Star Line established undeniable supremacy with their "Oceanic" class ships. The reply of the Inman Line was their famous crack liner *City of Berlin*, built by Caird & Co., of Greenock, and launched on October 27, 1874.

Her dimensions were 488·6 ft. by 44·2 ft. by 34·9 ft. depth of hold, but owing to her graceful counter stern and long clipper stem her overall length was 520 ft. This gave her a gross tonnage of 5,491 and a net tonnage of 2,957, while with her barquentine rig and yacht-like hull she was one of the prettiest ships of her day. Her engines were also built by Caird, and consisted of a single two-cylinder compound inverted machine with cylinders 72 ins. and 120 ins. in diameter by 66 in. stroke. She had surface



The iron-built Inman liner, *City of Rome*, which was one of the finest-looking steamships ever built. She came from the Barrow Shipbuilding Co.'s yard in 1881.

[*Face page 92*



General arrangement of machinery spaces of Inman liner *City of Rome*, built by the Barrow Shipbuilding Co. The

condensers, and the steam pressure was 75 lb. per sq. in.

Steam was supplied by twelve boilers, each with three furnaces, and when tried in 1875, the vessel worked up to an indicated horse-power of 5,200, which gave a mean speed of 14·825 knots on the measured mile, the designed speed being 14 knots. The screw was a single four-bladed iron one, with a diameter of 21·6 ft. and a pitch of 32 ft., while the auxiliary machinery was particularly complete for that day, and included steam steering gear by MacFarlane Gray.

The *City of Berlin* had accommodation for 202 first-class and 150 intermediate-class and steerage passengers, her saloon being amidships instead of aft, as was the case in most ships of her day. She stowed 1,400 tons of coal, which was necessary for her somewhat extravagant boilers. Among her other interesting features she was the first ship on the Atlantic to be given electric light, that being fitted in November, 1879.

She had not the least difficulty in winning the Blue Riband as soon as she came out, her record westward passage being 7 days 18 hours 2 minutes, and all through her career she was

an excellent steamer, although somewhat extravagant.

At the beginning of 1887 she was taken in hand by Laird, of Birkenhead, to have her hull thoroughly overhauled and her engines and boilers replaced. The new machines were three-cylinder triple-expansion engines with cylinders 41, 65 and 101 ins. in diameter, by 66 in. stroke. Steam at a pressure of 150 lb. per sq. in. was supplied by eight three-furnace cylindrical steel boilers. The grate area of these boilers was 324 sq. ft., and the heating surface 14,600 sq. ft., while they were also fitted with Howden's system of forced draught, which in those days was something of an innovation.

On her preliminary trials with the new machinery, in December, 1887, she indicated 6,025 horse-power, with 152 lb. boiler pressure, 25½ in. vacuum and 66·3 r.p.m. Her higher speed, coupled with the fact that her passenger accommodation had been completely rebuilt and her upper and main decks plated in, with the fitting of new deck houses and a 180 ft. promenade deck, returned her to her old favour on the North Atlantic. Unfortunately, the reconstruction

appears to have broken her good luck, and she had a long list of minor accidents until she was taken off the regular run in 1895, and only employed in yachting and special services.

In 1898 the United States Government bought her for the purpose of repatriating their troops who had fought in the Spanish-American War, and in company with the other ships of their transport fleet they re-named her after one of the Civil War generals, *Meade*. In 1906, while on their regular trooping service to the Philippines, she was very nearly destroyed by fire in San Francisco, six men being killed and a number injured. She was long past her active service career, and for some years before the war the *City of Berlin* was laid up awaiting a purchaser, and the subject of a good deal of political question. When the United States came into the war, however, she was overhauled and sent to Boston as training ship for the United States Shipping Board, which was then sending youngsters to sea as soon as they could go through an intensive course of seamanship, and was eventually sold to the shipbreakers shortly after the Armistice.

Although the *City of Berlin* easily regained the Blue Riband for her owners in 1875, she was not allowed to hold it for long, and was quite outclassed by the *Britannic* and *Germanic* of the White Star Line, and then by the *Arizona* of the Guion Line. When the last-named company announced its intention of going to John Elder & Co. at Fairfield for an improved *Arizona*, later to win the Blue Riband as the *Alaska*, the Inman Line determined to make a struggle for the position, and, accordingly, the famous *City of Rome* was laid down.

The vessel was ordered of the Barrow Shipbuilding Company, the predecessor of Vickers-Armstrongs, Ltd., and the original intention was to build her hull of steel, as the New Zealand Shipping Company had conclusively shown the superiority of that material. Unfortunately, supplies were very short, and to have waited for them would have meant losing the season, so her hull was built principally of iron and the extra weight not only prevented her carrying a paying quantity of cargo but also spoiled her speed. With her long clipper stem and counter stern her length overall was 586 ft., her Lloyd's dimensions being

560·2 ft. by 52·3 ft. by 37 ft. depth of hold, giving her a tonnage of 8,415 gross and 4,615 net. At 26 ft. draught her displacement was 13,500 tons and she was intended to have a dead-weight capacity of 5,500 tons.

The Inman liners were always noted for the solid comfort of their accommodation, in the saloon as well as the third-class which made their name, and the *City of Rome* had quarters for her 271 saloon passengers which were far superior to that of most of her competitors. The dining saloon was 72 ft. long by 52 ft. wide, the maximum height being 17 ft., and much trouble was taken with the decoration. One of her best publicity points was that electric light, on the Swan system, was fitted in the engine room and principal public rooms.

The vessel was a single-screw ship, propelled by six-cylinder compound engines arranged in three tandem lines, with the cranks set at 120°, and with the high-pressure cylinder placed above the low-pressure cylinder. The diameter of the high-pressure cylinders was 43 ins. and that of the low-pressure 86 ins., while the stroke was 72 ins. The tandem arrangement made the engine

very high indeed, the top being actually above the main deck and making the ship terribly vulnerable were she ever to be used as an auxiliary cruiser. She was designed, however, before the Russian scare of 1885 caused the Admiralty to pay particular care to the design of liners, which they subsidised for this purpose, and to insist that as much machinery as possible should be below the water line. The nominal horse-power of these engines was 1,500; the maximum indicated horse-power, 10,000.

The thrust block had thirteen collars, 39½ ins. in diameter, an interesting comparison with the modern Michell type. The cooling surface of the condensers was 17,000 sq. ft., and she was well supplied with auxiliary machinery, including two air pumps, 39 ins. in diameter, two double-acting circulating pumps and a big centrifugal bilge or circulating pump.

Steam was supplied by eight six-furnace double-ended boilers, arranged two abreast. The mean diameter was 14 ft., the length 19 ft. Each of the two boiler rooms was 60 ft. long and wing bunkers extended their whole length to the after engine-room bulkhead. She had three funnels,

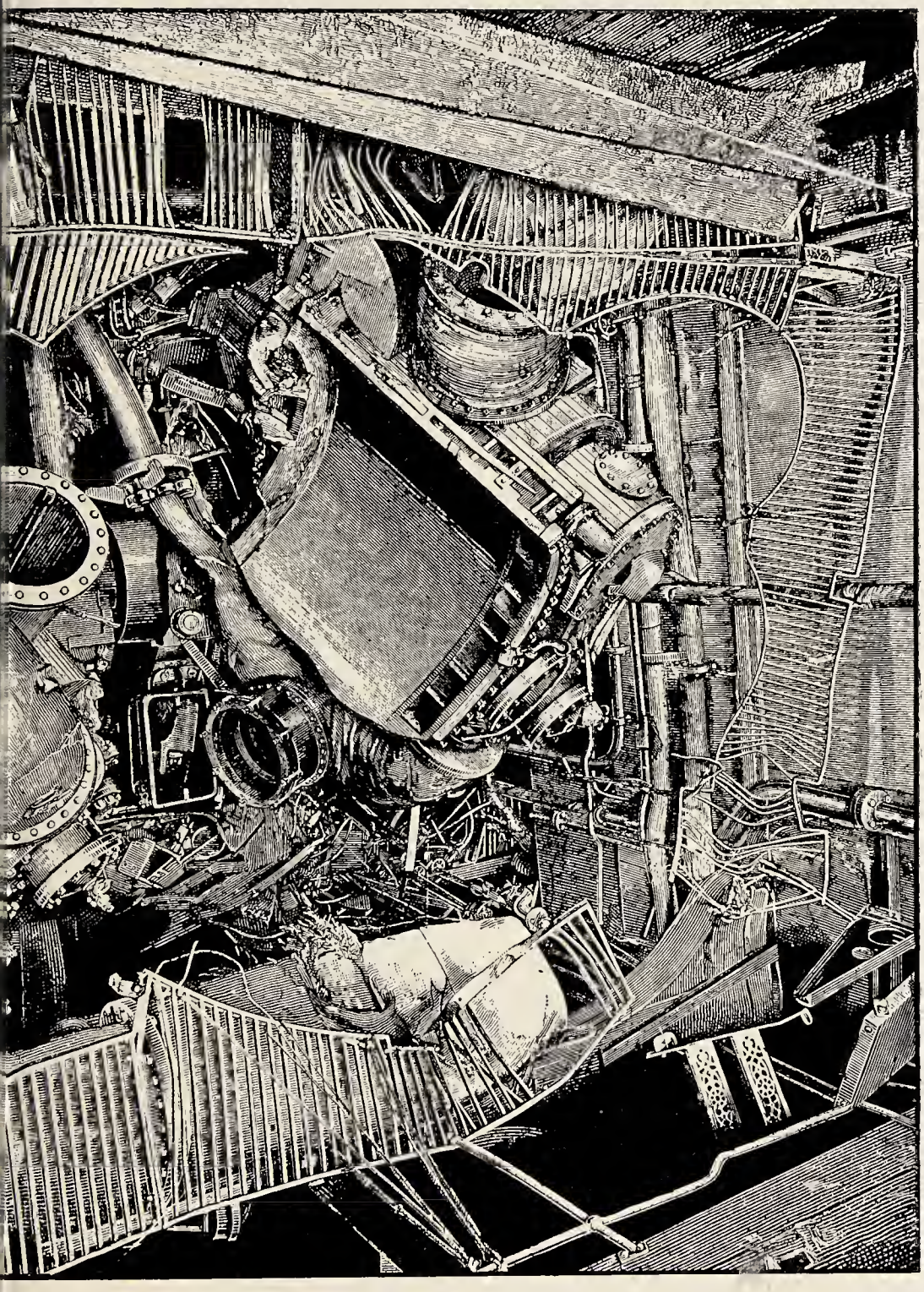
perfectly proportioned, the forward funnel leading from No. 1 and the forward end of No. 2 group of boilers, the midship one leading from the after end of No. 2 and the forward end of No. 3, with the uptakes straddling the thwartship bulkhead, and the after one leading from the after end of No. 3 and both ends of No. 4. Externally this arrangement gave a very pleasing appearance to the ship, but it considerably reduced the value of the bulkhead between the boiler rooms.

The liner's first misfortune was at her launch on June 14, 1881, when a donkey boiler, temporarily placed on deck, blew up and killed three men; her second disappointment was at her trial, when a hot bearing prevented her working up to more than three-quarters speed—45 r.p.m. instead of 60—but as she averaged 15·71 knots it was anticipated that her speed would be satisfactory. Trial troubles gave the builders and engineers of the Inman Line the opportunity of scrapping a number of "gadgets" that had been worked into her, much against technical advice.

The maiden voyage of the *City of Rome* started from Liverpool on October 13, 1881, and occupied

9 days 17 hours from Queenstown to New York, and 8 days 6 hours 45 minutes from New York to Queenstown. As the *Arizona's* record then stood at 7 days 10 hours 47 minutes and 7 days 8 hours 11 minutes, respectively, the Inman Line would obviously have to do very much better than that for her purpose as a record breaker. After five voyages she was returned to her builders, who, having made numerous alterations and cut out most of the crank ideas on which individual members of the Inman Company had insisted, handed her over to the Allan Line for management on their account. Her boilers were increased by one double-ended and one single-ended, her rig was lightened and the yards stripped, after which she did 18·5 knots on trial. But in spite of all this lightening she could only carry 2,200 tons of cargo as against the 3,800 tons guaranteed in the original contract, and she was never a money maker.

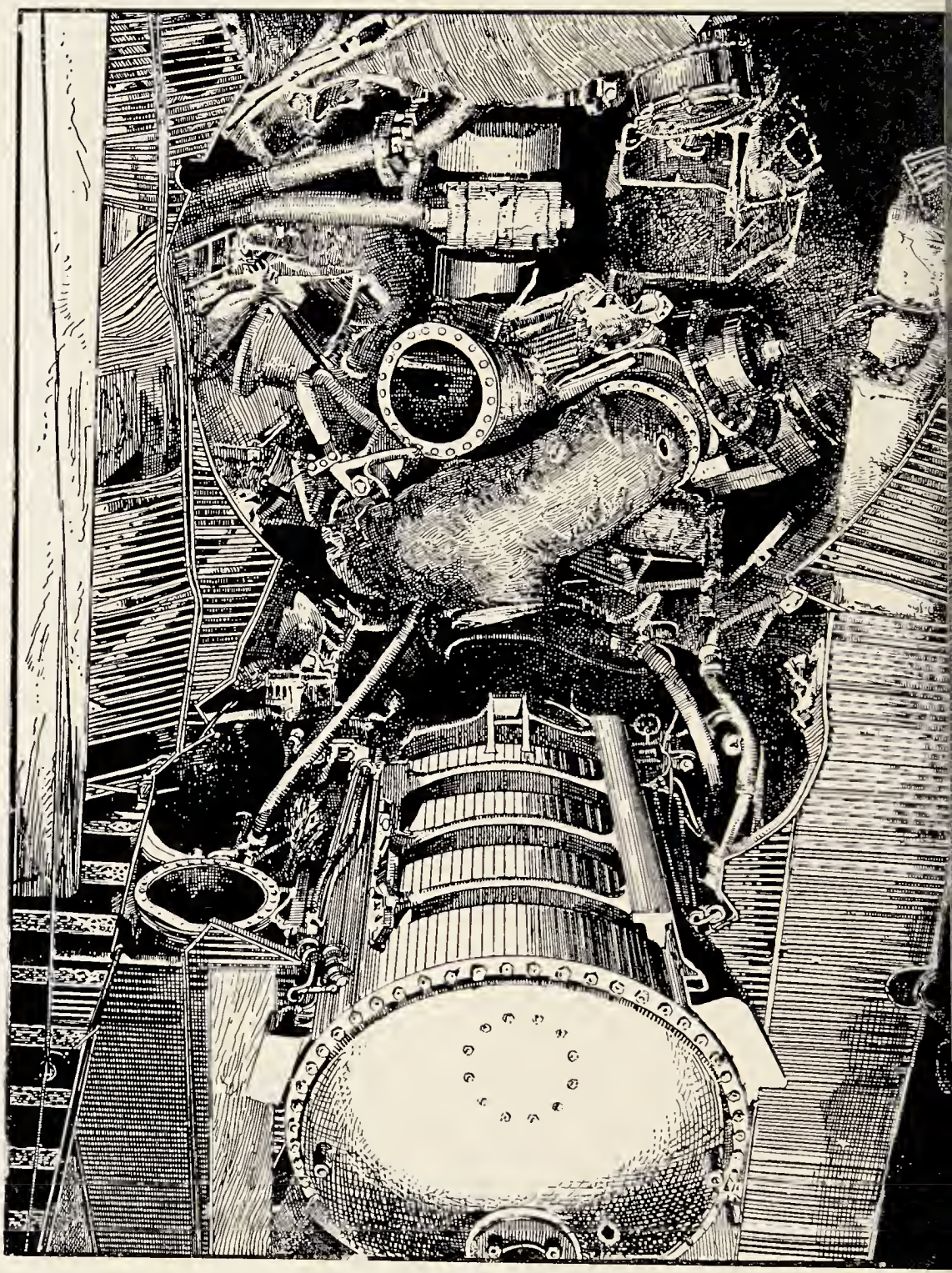
As far as popularity was concerned, however, there was nothing to complain about, and the *City of Rome* was always well booked, although it was found very difficult to obtain a suitable consort to run alongside her. After the Spanish–American



[*Reproduced from "The Marine Engineer," May 1, 1890.*

w showing the wrecked starboard engine of the *City of Paris*. The disaster was one of the worst of its kind in the history of marine engineering.

[*Face page* 100



[Reproduced from "The Marine Engineer," May 1, 1890.

Wrecked engine-room of the *City of Paris*. The propeller shaft fractured at full speed and the 113-in. low-pressure cylinder was shattered when the connecting-rod bolts failed

Face page 101]

War she was chartered to take Spanish prisoners home, and as soon as she was returned to the Atlantic Ferry she had the misfortune to collide with an iceberg, being saved by her clipper stem and bowsprit.

In the early days of the South African War it was planned to convert the vessel into a hospital ship, but this idea was abandoned on account of cost, and she was commissioned as a transport in January, 1900. After proving herself one of the most successful ships in the trooper fleet, she was sold, in October, 1902, to German shipbreakers for £17,500. During the scrapping operations the hull sank at the berth; even in her final phase she was unprofitable.

It was only natural that a line which had twice held the pre-eminent position on the North Atlantic, although for relatively short periods, should not be deterred permanently by the failure of the famous *City of Rome*. Two new vessels were therefore ordered in the 'eighties which bore the names of *City of New York* and *City of Paris*, both names which had already been successfully and popularly borne by earlier vessels on the run. The *City of New York* was placed on the

station in March, 1888, just at the time that financial control of the company had passed into American hands, and the name of the line changed to Inman and International. The *City of Paris* followed in April, 1889.

These splendid ships were twin-screw steel steamers built by J. & G. Thomson, at Clydebank. In many respects they were a considerable advance upon anything afloat at that time, one notable feature being the great depth of beam adopted on the recommendation of the builders. Considerable attention was paid to the question of sub-division into water-tight compartments, the use of fore and aft centreline bulkheads being made possible for the first time by the introduction of twin-screws into the Atlantic Ferry.

The machinery consisted of separate port and starboard sets of three-crank triple engines. The boilers had a pressure of 150 lb. per sq. in. and were fitted with forced draught on the closed stokehold system. In 1891, the Howden system of forced draught was fitted on the *City of Paris*. During her first season, the *City of Paris* reduced the Atlantic passage to less than 6 days, gaining the eastbound record in August, 1889, by a trip

of 5 days 23 hours 38 minutes at an approximate speed of 19·52 knots. In the following month she also won the westbound record, at the same time averaging 20 knots throughout for the first time in the history of the ferry.

One of the outstanding accidents on the North Atlantic was that which occurred to the machinery of the *City of Paris* on March 25, 1890. She was nearing the Irish coast on a homeward run when the propeller shaft fractured at full speed and the 113-in. low-pressure cylinder was shattered when the connecting rod bolts failed. This completely wrecked the starboard engine. The disaster was one of the worst of its kind in the history of marine engineering. Although completely disabling the vessel the breakdown caused no injury to life or limb, and at no time was there any danger of foundering. The ship floated quite safely until towed into Queenstown harbour where she was only detained for a short time while the wrecked sea connections were closed and the water pumped out. She then proceeded under her own steam to Liverpool. Until this mishap it was generally assumed that total disablement and flooding of both port and starboard

engine-rooms was almost impossible, but in this case, portions of the wrecked starboard machinery damaged the centreline bulkhead and the water which had entered owing to the breakage of the sea connections and filled one engine-room was thus enabled to flow freely into the other. The May 1, 1890, issue of *The Marine Engineer* published two remarkably fine woodcuts giving an excellent idea of the devastating effects of this accident; these are reproduced on pages facing 102-3.

The Inman Line passed from the private ownership of its founder into that of a private limited company in 1875. Just over ten years, namely in September, 1886, efforts were made to raise additional capital by the public issue of debentures, but the endeavours were unsuccessful. The whole organisation and fleet was then purchased by the International Navigation Company of America (Red Star Line), and the line was reconstituted under the house flag and name of the Inman and International Line in 1888. Finally in March, 1893, American ambitions to have a first-class line of their own resulted in a change of name to the American Line and the transfer

of the two principal vessels, *City of New York* and *City of Paris*, to the American flag. The United States law had hitherto prevented any foreign-built vessel from flying their flag but the law was modified to allow of those ships being so transferred, and their names were changed to *New York* and *Paris*, the prefix "City" passing away with the final discontinuance of use of the energetic William Inman's name.

Following these changes the route was altered from New York—Liverpool to a direct service from New York to Southampton which was inaugurated by the arrival at the latter port of the *New York* on March 4, 1893, whence she sailed again March 11.

No mention of this once-famous line would be complete without a note on the career of its founder, William Inman, who was born in Leicester on April 6, 1825. He was the son of Charles Inman, then a partner in the well-known firm of carriers, Pickford & Co. When his father retired from business the family migrated to Liverpool and it was in that city that William finished his education and started his business career. He eventually became a partner in

Richardson, Bros. & Co., and it was in conjunction with that firm that he promoted the once-famous Inman Line, which he managed so successfully that it rapidly became a power on the North Atlantic. He died at his home at Upton, Cheshire, in his fifty-sixth year on July 3, 1881.

CHAPTER IX

THE WHITE STAR LINE

One of the romances of the shipping trade in the latter half of the nineteenth century was the career of Thomas Henry Ismay. He was born at Maryport in 1837, and going to Liverpool from Cumberland in 1852, he served his apprenticeship with the then well-known shipping firm of Imrie, Tomlinson & Co. He then went in a sailing ship on a trip to the west coast of South America. On his return, he commenced business as a shipbroker, joining P. Nelson & Co., in 1860, as a junior partner, where he rapidly gained a reputation for ability and integrity. In 1864 he joined the board of directors of the National Line.

About 1866 he purchased the White Star Company, a Liverpool firm of sailing ships, which had its origin in the days of the Australian gold

rush, and ran a fleet of the old type of sailing clippers.

Although there were five or six steamship companies engaged in the Liverpool–New York passenger trade, Ismay decided that there was room for another. He formed the Oceanic Steam Navigation Co., Ltd., on September 6, 1869, to take over the White Star house flag, with a nominal capital of £400,000 in £1,000 shares. It says much for the reputation of Ismay that, although only thirty-two years old, he got his capital rapidly subscribed by some of the leading shipowners of the time. The seven original signatories were:

Thomas Henry Ismay	...	50 shares
George Hamilton Fletcher	...	50 ,,
Gustav Christian Schwabe	...	12 ,,
John Dugdale, junior	...	12 ,,
James Dugdale ...	...	12 ,,
Joseph Hyde Spark	...	10 ,,
James Hainsworth ...	...	10 ,,

The first list of shareholders includes the names of Edward James Harland, engineer and iron shipbuilder, and Gustav William Wolff, iron ship-

THE FAMOUS SINGLE-SCREW IRON STEAMER "OCEANIC" OF 1871

The pioneer of the White Star fleet. She was a vessel of 3,807 tons, built by Harland & Wolff Ltd., at Belfast.

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THE "BALTIC" OF 1871

One of the earliest White Star liners. She made a record crossing in January, 1873, being the first steamship to average over 15 knots across the Atlantic.

builder, thus starting an association with the famous Belfast firm of shipbuilders which has been retained ever since.

It was to Harland & Wolff that Ismay went for his first steamer, the *Oceanic*, which was the first steamer to fly the White Star pennant. She was a single-screw iron vessel of 3,807 gross tons, with dimensions of 420 ft. by 41 ft. by 31 ft. The vessel was the pioneer of many improvements in the amenities provided for passengers, for example, the placing of the saloon and state-rooms amidships, the adoption of electric bells, and the provision of separate chairs in the saloon for each passenger.

The *Oceanic* crossed from Belfast to the Mersey in February, 1871, and left Liverpool on her maiden voyage to New York on March 2. Her engines were of the four-cylinder compound type, with two 41-in. diameter high-pressure, and two 78-in. low-pressure cylinders, working on two cranks with a stroke of 5 ft. Steam was supplied from twelve boilers with a working pressure of 65 lb. per sq. in. The engines were built by Maudslay, Sons & Field, of London, and proved very satisfactory, giving the ship a service speed

of 14½ knots with a daily consumption of about 65 tons of fuel.

The names originally selected for the "Oceanic" class were: *Oceanic*, *Baltic*, *Atlantic*, *Pacific*, *Arctic*, and *Adriatic*. Some of these names had previously been borne by Collins vessels, two of which were particularly unlucky, and therefore it was decided not to "court disaster" by adopting them; *Republic* and *Celtic* were substituted for *Pacific* and *Arctic*. It will be noticed that, from the start, the White Star fleet names have been characterised by the suffix "ic".

Although the *Oceanic* herself never captured the speed trophy, the *Adriatic* and *Baltic* improved on the best Inman times in 1872, only to lose again to the *City of Berlin* as we have already seen. But as the pioneers of the "Oceanic" class, vessels of 3,700 tons with a speed of 14 knots, had established themselves so firmly in the favour of the Atlantic traveller, in keen competition with the Inman and Cunard lines, the White Star directors decided that the continued possession of the Blue Riband was the finest possible advertisement. Accordingly, the *Britannic* of 1874, and her sister ship *Germanic*, were designed

with the express intention of holding it. Their gross tonnage had increased to rather more than 5,000, and the added power of the engines caused them to be given two funnels instead of one, but essentially they were a development of the successful "Oceanic" type.

The lines of the *Britannic's* hull were an appreciable development, having an extremely fine entrance and the absence of forefoot which is conspicuous in Harland & Wolff designs. A long and full midship section led into a good run aft. Safety was provided in a manner ahead of her time by eight complete bulkheads and a partial one.

The engines of the vessel were the most interesting feature. At that time Harland & Wolff had not perfected their engine department, and she was like her earlier sisters in that she had to get her machinery brought round from the Thames. It was constructed by Maudslay, Sons & Field, and was a four-cylinder compound inverted engine with cylinders 48 and 83 in. diameter and a stroke of 60 ins. It was arranged that each pair of cylinders could be used as an independent engine in case of breakdown, the

machinery being designed by Mr. Charles Sells, the head of Maudslay's designing department. Such engines had previously been fitted almost exclusively in warships, for the limitation as to height crabbed the ideas of the designers considerably, but the success of the *Britannic's* engines led to a large number of foreign orders coming into Maudslay's, particularly from the Compagnie Générale Transatlantique.

One of the novelties was the introduction of the tandem principle, each set of two cylinders being placed one above the other on the fore and aft line of the shaft, the pistons of each set being connected by a solid steel piston rod which passed through both cylinders and was connected to a crosshead and then attached to the crank-shaft by a connecting rod. The regulating and expansion valves were worked direct from the shaft, being controlled by a small steam engine. These engines were designed for an indicated horse-power of 5,400, which, at 52 r.p.m., gave the ship a speed of 16 knots. She could always be relied upon to average rather more than 15 knots on from 75 to 80 tons of coal per day.

The engines were supplied with steam by eight double-ended boilers, each 20 ft. long by 8 ft. 10 ins. in diameter, working at a pressure of 70 lb. per sq. in. Each had four furnaces and 304 tubes, the heating surface being 19,500 sq. ft. When "all out" they consumed 110 tons of coal per day—the bunkers stowed 1,100 tons—or 1·8 lb. per I.H.P. per hour. The condenser contained 4,650 solid drawn brass tubes $\frac{5}{8}$ in. in diameter, having a cooling surface of over 10,000 sq. ft., the circulating pump being a 6-ft. centrifugal worked by a 30 horse-power engine. It was always used as a surface condenser, but it could be adapted to jet injection. The fresh-water condenser supplied 1,000 gallons per day.

This machinery installation had one great disadvantage, which was afterwards overcome. In order to prevent racing and to permit the screws to work well submerged, there was no steel piece under the screw aperture, the screw being lowered so that the blades worked well below the level of the keel.

To obtain this, the cylinders were set at a slight rake and the two after-sections of the shaft were connected by a universal joint in a separate

compartment easily accessible to the engineers. This screw could be raised or lowered either by steam or hand without stopping the engines, but it caused so much vibration, and the radial gland and stuffing-box were such a source of danger, that the arrangement was soon scrapped at considerable expense.

Apart from this unusual design feature, the *Britannic* was a success from the first, but while she had the universally-jointed shaft she was nursed, and it was not until 1876 that she lowered the record held by the *City of Berlin*. After that she and her sister ship, the *Germanic*, were constantly clipping minutes off their own and one another's records, and they held their reputation for speed until the commencement, with the *Arizona* of 1879, of John Elder's series of Guion liners.

After running very successfully on the western ocean, the *Britannic* was taken into Government service as a transport at the outbreak of the South African War, Commodore Sir Bertram Hayes, then a very junior captain, being put in temporary command, which soon became a permanent one.

In 1902 she was sent to her builders' yard to receive new engines and boilers and to be refitted for the passenger service, but an examination of her hull and the trend of the Atlantic Ferry at that time suggested that it would be money thrown away to recondition her. Accordingly, she was sold to German scrappers for £11,500, although she was still capable of her original speed.

After being robbed by the *Arizona* of the Blue Riband in 1879 the directors of the White Star Line ceased to be actively interested in such high speed, excepting for a short period mentioned in a subsequent chapter, when the record-breakers *Majestic* and *Teutonic* came out in the 'nineties. Rather has White Star success been based upon moderate speed, extreme comfort, and good cargo-carrying capacity. The vessel upon whose success this policy was founded was the *Cufic* which was launched by Harland & Wolff on October 10, 1888, and made her first voyage in January, 1889.

The *Cufic* was designed primarily as a first-class cargo carrier with unusually large stowage, and at the same time comfortable accommodation for a limited number of passengers. So successful

was she that in subsequent types the number of passengers was increased steadily, until in the *Adriatic* the highest point of the policy was reached, to remain for many years.

The dimensions of the *Cufic* were 430·7 ft. by 45·2 ft. by 30 ft. depth of hold, giving her a gross tonnage of 4,639 tons. The hull had seven bulkheads, and the ship was of the three-island type. She was the finest and most up-to-date cargo carrier on the Western Ocean, but it was in the engine room that she attracted most notice. All the White Star liners down to the *Gaelic* and *Belgic* of 1885 had been fitted with compound engines, but in the *Cufic* triple-expansion engines of 2,400 I.H.P. were installed, the cylinders having a diameter of 27 ins., 44½ ins. and 74 ins., with a stroke of 60 ins. The working pressure was 180 lb. per sq. in. Economy both in men and fuel was the object aimed at, and in this Harland & Wolff, Ltd., succeeded admirably. Her first voyage showed her not only to be a most satisfactory cargo carrier, but capable of maintaining her steady 13 knots in all weathers with what was then considered to be extraordinary economy. Her design was copied

THE WHITE STAR LINER "BRITANNIC"
Built in 1874, by Harland & Wolff, Ltd., at Belfast.

THE "GERMANIC"
A sister ship to the White Star Line's record-breaker *Britannic*.

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THE WHITE STAR LINER "CUFIC"

Built by Harland & Wolff, Ltd., at Belfast in 1888. She laid the foundations of the White Star policy of moderate speed and extreme comfort.

almost exactly in several other ships flying the White Star flag, and led eventually to the "Big Four."

In the summer of 1896 the *Cufic* was purchased provisionally by the Compania Transatlantica and received the name of *Nuestra Senora de Guadalupe* for trooping service in connection with the Cuban rebellion, which later grew into the Spanish-American War. In the following year the Spaniards decided that they were well advised to return her to the White Star Company under the clause in the contract that gave them the right to do so on certain terms. When she rehoisted the White Star house flag she resumed her old name of *Cufic*. In December, 1900, she was unlucky in losing her propeller in the North Atlantic, while on passage from Liverpool to New York. The Hill steamer *Kansas City* fell in with her, disabled, and finally undertook to tow her to port. In the heavy weather it was three days before they could get a line across, and even then two hawsers parted. On the second occasion, Mr. Crosbie, chief officer of the *Cufic*, jumped overboard with a line to save the risk of losing a boat; the attempt cost him his life.

Eventually she was towed safely into Queenstown, £6,800 being paid as salvage.

Towards the end of 1901 the *Cufic* was purchased by the Dominion Line and renamed *Manxman*, running to Portland, Maine, in the winter and the St. Lawrence in the summer. Later she was transferred to the service between Avonmouth and Canada. In October, 1915, she was sold to a Montreal firm, R. Lawrence Smith, Limited, and they contrived to make a large profit out of her until the autumn of 1917, when she was taken up by the Army to carry wheat and horses from the United States and Canada. Although her service was repeatedly varied, carrying coal to the fleet at one time and maize from South Africa at another, she was not finally released from Government service until February, 1919, and soon afterwards was sold for a very big price.

Her last owners were the Universal Transport Company of New York, and it was while on their service, on December 17, 1919, that she was encountered in mid-Atlantic by the tanker *British Isles*, listed heavily and leaking badly. The tanker attempted to take her in tow, but did not succeed in getting a line across, and early next morning,

while standing by, lost sight of her for a few minutes in a heavy snow squall. When it passed there was only wreckage to be seen, with the crew of one lifeboat doing their best to pick their messmates out of the water. Eventually the second officer and fifteen men were saved by the *British Isles*, over forty members of the crew being drowned.

Before the close of the century, Thomas Henry Ismay died, after having seen his enterprise grow in thirty years into one of the greatest shipping undertakings flying the Red Ensign. His death in November, 1899, was, in fact, two months after his latest vessel, the new *Oceanic*, started on her maiden voyage. Her length of 685 feet was then the greatest in the world (she was also the first vessel to exceed the *Great Eastern* in this particular), so that Ismay lived just long enough to see the White Star Line pre-eminent in yet one other direction.

CHAPTER X

THE GUION LINE

One of the noted fleets of sailing vessels which was still doing a good trade in the 'sixties was that known as the Black Star Line, which handled an extensive emigrant traffic from Liverpool to New York. Realising that the days of sail in this trade were rapidly passing, the managers, Williams and Guion, inaugurated the Guion Line of Steamships in 1866. The former gentleman represented the line in New York, and the latter in Liverpool.

Stephen Barker Guion, the chief founder of the line, was born in America in 1819, and went to Liverpool about 1851 in connection with the steerage passenger trade of the Black Star Line of sailing ships. After having considerably developed this business he joined the Cunard Company for the purpose of working up their

steerage passenger traffic, but his service as an agent with them was quite short. Following a similar association with the National Line, he founded the service which bore his name, and remained at the head of this business until shortly before his death in Liverpool on December 19, 1885.

The new line made strenuous efforts to raise itself from the emigrant class, in which its owners had made their money, to the record-breaking class, but it was not until 1879, that they succeeded in wresting the honours with the famous *Arizona*.

The first vessel of their fleet was the screw-propelled iron steamship *Manhattan* of 2,869 tons. She was 335 ft. long, 42½ ft. broad, and 28 ft. deep, and was built on the Tyne at Jarrow by Palmers. Power was supplied by low-pressure inverted direct-acting surface-condensing engines, constructed and installed by the builders. The cylinders had a diameter of 60 ins. and a stroke of 42 ins.

Successive vessels included the *Minnesota*, *Nevada*, *Idaho*, of no particular historical interest, but in 1870, Palmers built and engined the well-known *Wyoming* and *Wisconsin*, each was an iron

vessel of 3,238 tons, 366 ft. long, 43 ft. 2 ins. broad, and 34 ft. deep. The propelling machinery was of the compound type, and was among the first of its kind in the Atlantic trade. One vertical high-pressure cylinder, 60 ins. in diameter, and one double-trunk horizontal low-pressure cylinder, 120 ins. in diameter, each worked on the same crank, the stroke being 42 ins. Corliss valves were fitted, the boilers worked at what was then the high pressure of 70 lb. per sq. in.

Two years later, the Guion Line had sufficiently felt its feet to attempt a serious bid for the fast traffic, and with this end in view, ordered two strange vessels departing materially, both in hull and machinery, from the then-existing practice on the North Atlantic. These ships named respectively, *Montana* and *Dakota*, were most interesting from the engineering point of view, but both failed dismally to attain their objects. The two vessels were built by Palmers, of Jarrow, after the designs of John Jordon, the company's superintendent engineer. In appearance they were peculiar ships, being single-screw iron brigs with a cutaway straight stem and an excessive tumble-home of 8 ft. on either side. They had a

gross tonnage of about 4,300 tons on dimensions of 400·6 ft. by 43·4 ft. by 32·7 ft. depth of hold.

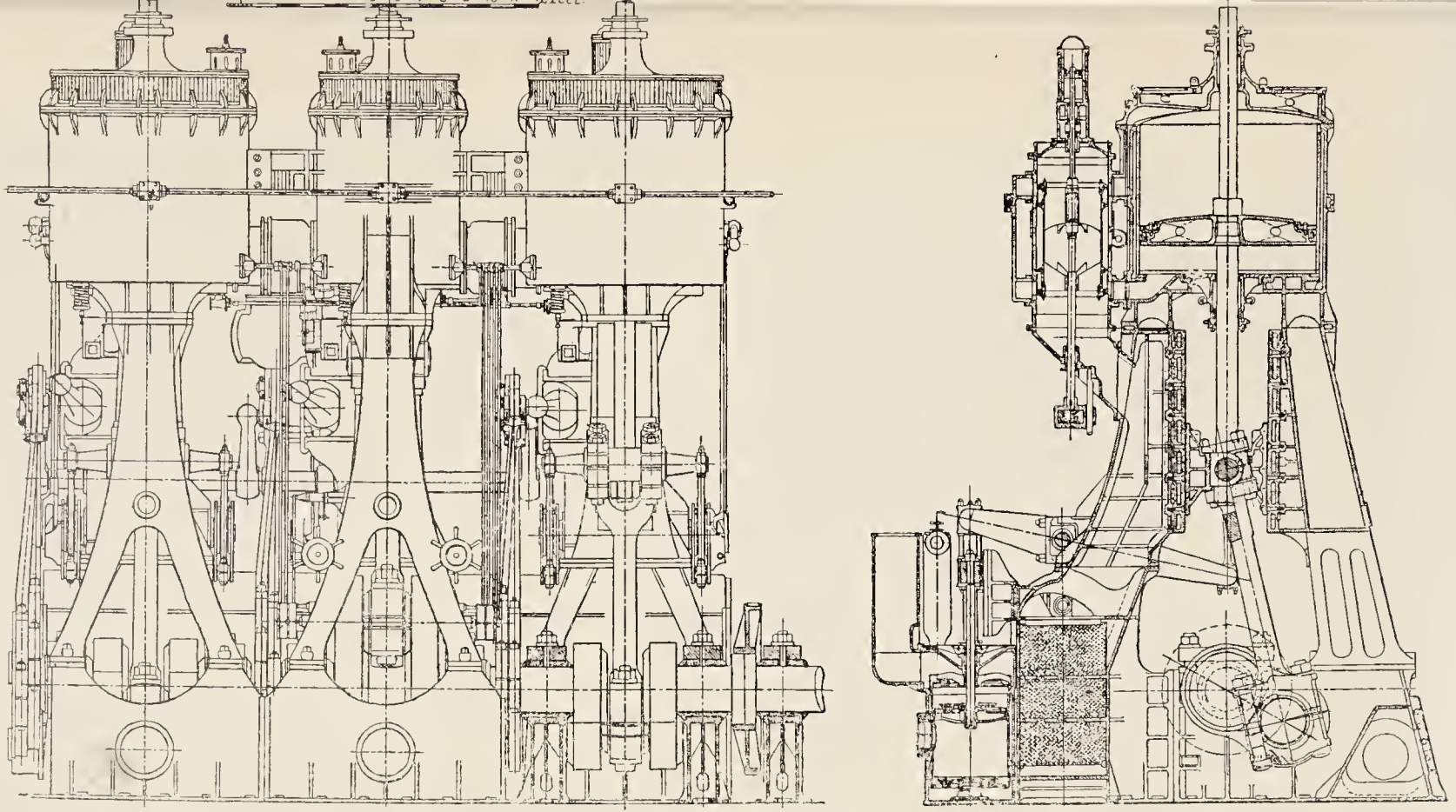
Their machinery was as peculiar as the hull design, and was also designed by Mr. Jordon. The engine was, in each ship, of the three-cylinder compound type, having one vertical high-pressure cylinder, 60 ins. in diameter by 42 in. stroke on the forward crank, with two horizontal low-pressure cylinders 113 ins. in diameter, working on the after crank. Corliss valves were fitted to all three cylinders, and the whole arrangement was exceedingly complicated and inaccessible.

The boilers fitted were of the water-tube type, and represented what was probably the first real attempt to use boilers of this tube in a vessel of appreciable size and power. The boilers worked at a pressure of 100 lb. per sq. in., which was high for that period, and every precaution was taken to give them the necessary strength for marine work.

There were ten boilers, each having thirty-five tubes 15 ft. long by 15 ins. in diameter and $\frac{3}{4}$ in. thick. These tubes were arranged in five

rows, these having an inclination of 9 ins. in the length of the boiler and being staggered to give a good path to the hot gases. The tubes in the same vertical line were fitted into header pipes 6½ ins. in diameter. No less than 700 manhole doors were fitted in the boilers, with innumerable connections, and with their cast-iron framing, wrought-iron girders, and extensive brickwork their weight was very great.

These boilers were placed back to back, five on either side on the keel line, while the stokeholds, each 80 ft. in length, ran along the ship's sides. The *Montana* was the first ship to be completed with this novel machinery equipment, and was to be tried on the passage round from the Tyne to Liverpool. Thirteen hours out she began to blow out boiler tubes, injuring firemen and causing something like a panic on board. Before she had been at sea thirty-eight hours five of her ten boilers were out of action, and it was decided to put into Portsmouth for temporary repairs. Finally, she made Liverpool, but the Board of Trade refused to give her a passenger certificate at Newcastle, and at Liverpool they insisted on a six-day trial before they would pass



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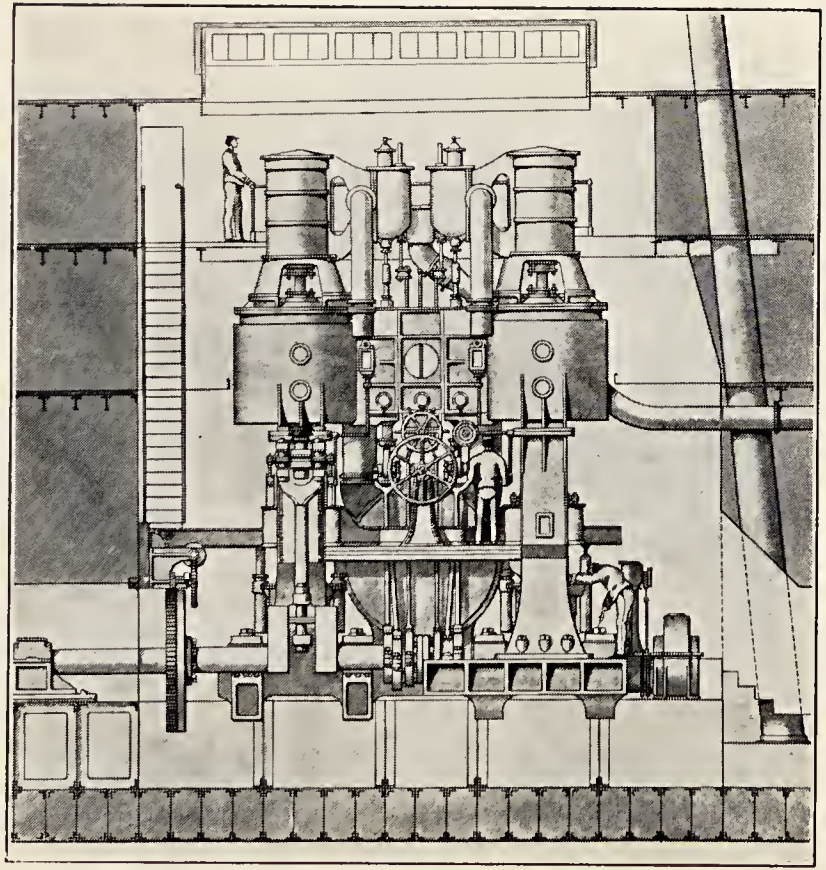
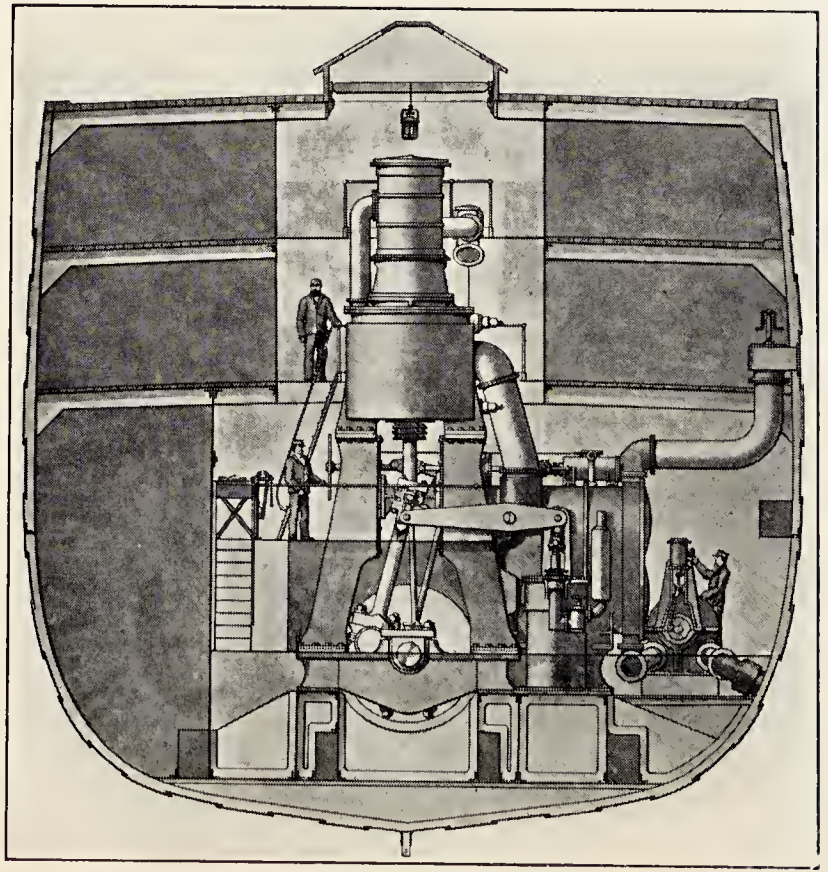
[Reproduced from "The Marine Engineer," September 1, 1881.

THREE-CRANK COMPOUND ENGINES FOR THE GUION LINER "ARIZONA," BUILT BY JOHN ELDER, GLASGOW

Face page 125]





Arrangement of the propelling machinery of the White Star Liner *Britannic* of 1874. The engines were designed and built by the famous old firm of Maudslay, Sons & Field.

her. She was tried in a gale, when she certainly had an opportunity of proving herself a fine sea-boat, but once again the tubes began to blow out in several of her boilers, and it was wisely decided to remove these boilers and substitute ordinary cylindrical steam generators. The *Dakota* thus never actually put to sea with her water-tube boilers.

It was hoped to get a speed of 17 knots out of the *Dakota* and her sister ship. When the *Dakota* was finally ready for sea she gave every promise of attaining this speed without difficulty, but on the way round to Liverpool the low-pressure engines gave out through the corliss valve rods bending due to their being of too light a construction. The low-pressure engines were disconnected and all sail was set in order to keep the ship off the land. The high-pressure engine was kept going for a time, but after a short while a supplementary steam pipe burst. Finally, she was ready for sea and took her maiden sailing on the Atlantic ferry service, in July, 1875, under the command of Captain Forsyth. She was, however, a bitter disappointment as regards speed, and could not approach anything like 17 knots

on service. Her usual Atlantic passages were ten days and more, while her engines were constantly giving trouble, and on her seventh voyage her coal supply gave out, although her bunker capacity was supposed to have been particularly large. Perhaps the greatest stroke of luck that ever fell to the old Guion Line occurred in May, 1877, when the *Dakota* was wrecked on the Welsh coast. Curiously enough the *Montana* also finished her career by being wrecked on this same coast in March, 1880, and within a few miles of the *Dakota*.

Undeterred by failure the Guion Line made a further bid with the *Arizona*. It was in March, 1879, that John Elder & Co. launched from their Fairfield yard this ship which made history on the North Atlantic, and was the first vessel to be given the popular title of the "Atlantic Greyhound." In the *Arizona*, thanks to the genius of Mr. William Pearce, of Elders, the owners finally scored a triumphant success.

Her dimensions were 450·2 ft. between perpendiculars, 465 ft. overall by 45·4 ft. beam, and 35·7 ft. depth of hold. Her gross tonnage was

5,147, and her net 2,928, while she was remarkably, strongly built of iron. Like all Atlantic liners of her day she was a single-screw ship, her engines being a set of three-cylinder inverted compounds, with cylinders 62 and 90 ins. in diameter, with a stroke of 66 ins. Their nominal horse-power was 1,200. They were the first set of three-crank compound engines, the high-pressure cylinder being placed between the two low pressures.

On a draught of 26 ft. she stowed 1,200 tons of coal and 2,600 tons of cargo, and, in addition, she had what was regarded as a very big passenger accommodation. The 140 saloon passengers were accommodated immediately forward of the machinery, the saloon itself being 40 ft. long for the whole width of the ship. The 70 second-class passengers were berthed immediately abaft the machinery, and the 140 steerage passengers right aft, but should it be necessary the whole of the lower deck could be adapted to berth 1,000 more steerage passengers.

Her first trip to New York was then the fastest maiden voyage on record, but it did not win the Blue Riband; that was to come later. She was

recognised, however, as a flyer and faster than anything else on the North Atlantic, and immediately became very popular with the travelling public. This popularity was increased in a very curious way, for, in November, 1879, ten minutes after the captain had left the bridge, she rammed an iceberg while travelling at something like 16 knots in a fog and telescoped 20 ft. of her bows.

She was taken to St. John's, but there were no repair facilities there, so that a false wooden bow was built, taken to the ship and there built on, when she returned across the Atlantic under her own steam and managed the passage in 6 days 17 hours 30 minutes. The public immediately maintained that a ship that could survive a collision of that sort was obviously the safest afloat, and flocked to book by her, but the captain and the second officer had their certificates suspended for six months.

In 1885, war with Russia appeared to be imminent, and the *Arizona* was one of the liners taken up to be armed as a cruiser. Nothing was prepared beforehand, so that the crisis was over before she was ready and nearly £30,000 was

thrown away on her. That was one of the principal reasons of the Government's action in taking proper measures to subsidise suitable merchant ships for conversion into liners whenever necessary.

When the Guion Line got into serious financial difficulties in the 'nineties, she was offered for sale, but was withdrawn at £20,000, being later purchased by Sir William Pearce, the second baronet, in 1897 for a Pacific venture in which he was interested. Before proceeding on this service she was laid up at the Fairfield yard for complete modernisation and re-engining. Her two stumpy funnels were replaced by one huge smoke stack close abaft the mainmast. Her passenger accommodation was completely altered, the second-class was abolished and space made for a few first-class and a thousand emigrants. The original boilers were replaced by new ones, three double-ended and two single-ended, while the new engines were triple-expansion units having cylinder diameters 34½ ins., 56 ins. and 92 ins. by 36 in. stroke.

With these machines the *Arizona* had no difficulty in making 15¾ knots on trial and was always good for 15 knots at sea, which,

considering her age, was excellent. She then went out to the Pacific and ran on a service which had been started from San Francisco to the Orient in opposition to the Pacific Mail, but had only just been placed on the station when she was chartered by the United States Government as a transport during the Spanish–American War, being afterwards purchased and admitted to the American registry by special Act of Congress as the U.S.S. *Hancock*.

Under this name she was still at work when the States came into the European War, and, despite her age, she contrived to cross the Atlantic in 1918 at an average speed of 13 knots with a battalion of Marines on board. The *Hancock* was laid up for scrapping at the end of 1924 after an effective life of forty-five years which reflected in the most highly creditable manner upon the excellent workmanship of her builders.

After the success of the *Arizona*, the Guion Line followed her up with the *Alaska* of 1882, and then, in spite of their financial troubles, ordered the *Oregon* so as to maintain a balanced service. The *Alaska* is remembered chiefly as

having made the first Atlantic passage in less than seven days when she crossed from New York to Queenstown in June, 1882. She was a similar type of vessel to the *Arizona*, but somewhat larger, having a gross tonnage of 6,400.

Perhaps the most interesting of all the Guion fleet was the *Oregon*, not only because she was the high-water mark of the combined efforts of her owners and of John Elder's yard, which is now, of course, the Fairfield Company, but because her career was undeservedly checkered.

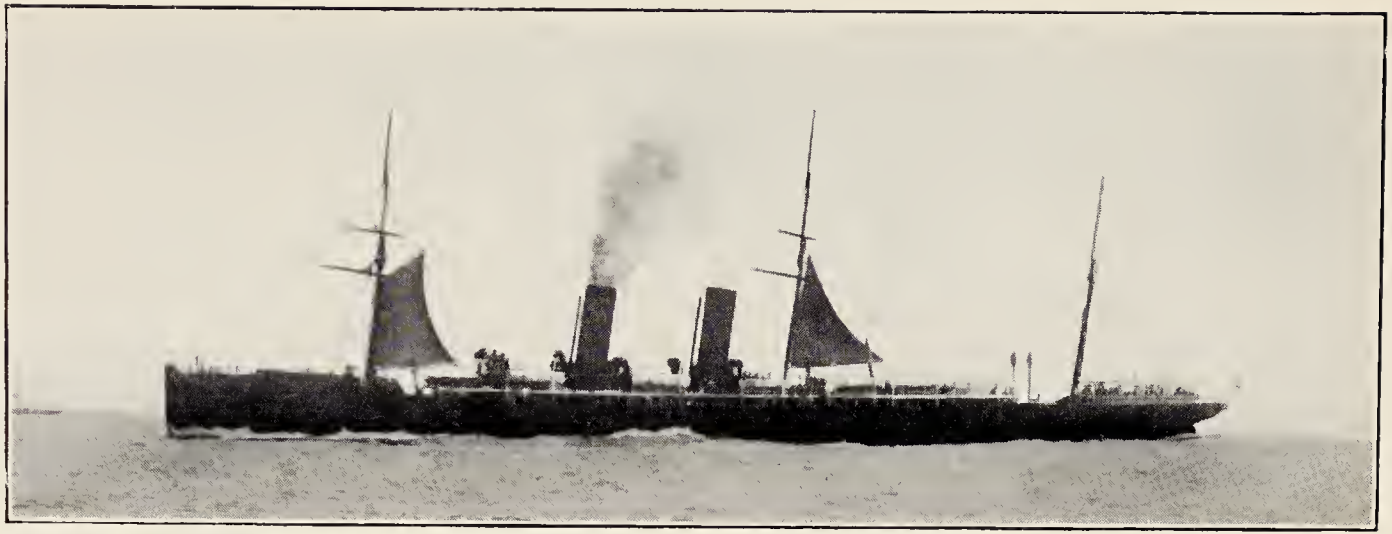
As regards her hull and rig, the *Oregon* was a development of the *Arizona* and *Alaska*. On her dimensions of 501 ft. by 54 ft. by 38 ft. depth of hold she had a gross tonnage of 7,375 tons and a net tonnage of 3,527 tons. She was fitted with four complete decks, a turtle back deck forward and aft and long promenade deck, her hull having nine bulkheads, of which seven extended to the upper deck. The immersed area of the midship section was 1,150 sq. ft., and the displacement 12,560 tons on 25 ft. draught.

For a single-screw ship her designed horse-power of 12,000 I.H.P.—3,000 horse-power more

than that of her predecessor the *Alaska*—meant a very big strain on the shaft, for it was the most powerful machinery ever put afloat at that date. Simplicity and strength were the main features of Elder's design, the engine being a three-cylinder inverted type compound, with a high-pressure cylinder 70 ins. in diameter and two low-pressures of 104 ins., the stroke being 72 ins. The crank-shaft, of crucible steel, was of the built-up type, and was an attempt to eliminate the constant broken shafts which were then the curse of the big Atlantic liners and which generally occurred through flaws in the solid forgings.

Steam was supplied by nine double-ended steel boilers, 16 ft. 6 ins. in diameter by 16 ft. 9 ins. in length, each having eight 3 ft. 6 in. furnaces of the Fox corrugated type, which were then at the height of their popularity. The fire grates were 6 ft. long, the grate area being 1,512 sq. ft. and the heating surface 38,047 sq. ft., interesting figures when compared with modern practice. The working pressure was 110 lb. per sq. in., although the boilers were tested to 220 lb. per sq. in., and proved entirely successful.

[*Face page* 132



THE "ETRURIA"

The famous single-screw Cunard liner of fifty years ago.

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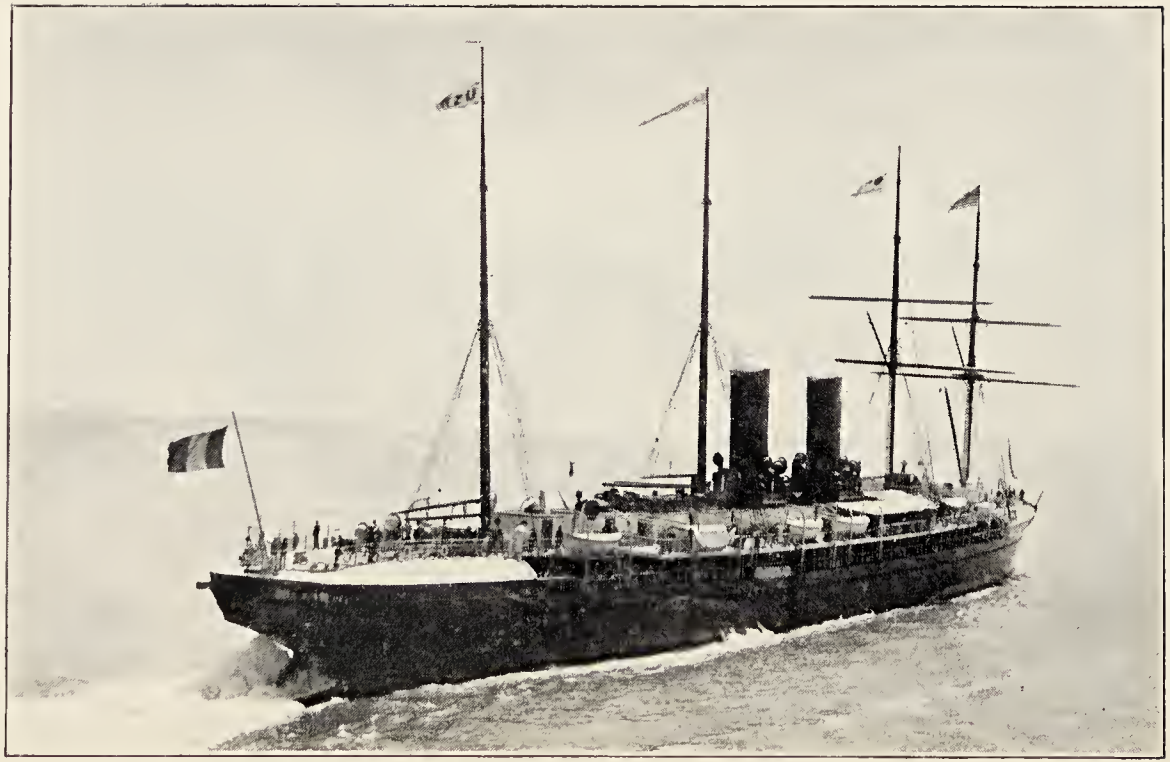


"La Bourgogne" of 1886

Built for the Cie. Gle. Transatlantique by Forges et Chantiers de la Mediterranée.

Her auxiliary machinery was on the simple side, but was most complete for a ship of her date. Steam steering was becoming popular, and the *Oregon* was fitted with it. Electric lighting was fitted all over the ship, an innovation which had been introduced on to the North Atlantic in 1879 after an unpleasant experiment with coal-gas.

As far as the passenger accommodation was concerned, the Guion Line believed in giving its patrons the best of everything, and her first-class accommodation for 340 passengers was really elaborate for that day. In addition, there were 92 passengers in the second-class and normally 110 in the steerage, but the 'tween decks were so fitted that they could be cleared of cargo to accommodate 1,000 additional passengers. When she was designed it was intended that she should be available for use as a trooper or cruiser in war-time. The saloon was 65 ft. by 54 ft., with a minimum head room of 9 ft. and a maximum of 20 ft. under the dome. The majority of the first-class cabins were for two passengers only, which again was an improvement on current practice.

She was ready for her trials in September, 1883, and ran from Ailsa Craig to Cumbrae Head at an average of 20 knots with 62 r.p.m. and 12,382 I.H.P. As she was designed for 18 knots only, this was most creditable, but her draught was 23 ft. 8 ins. against a designed maximum of 25 ft. She made her first sailing on October 7, 1883, and, as soon as she got to sea, showed that she was a remarkably fast ship, her maiden outward voyage being 7 days 8 hours 33 minutes, a record for a maiden trip, while her best day's run of 456 miles, an average of 18·5 knots, was the best she ever recorded.

Her third homeward passage won her the Blue Riband of the Atlantic, occupying 6 days 16 hours 57 minutes at an average of 18·08 knots, but she only did four passages under the Guion flag, when the company was unable to stand the financial strain and she was transferred to the Cunard Line to run alongside the *Umbria* and *Etruria*, which had been built at the Fairfield yard for the express purpose of beating her. The *Oregon* made her first sailing under the Cunard flag on June 7, 1884.

When there was a scare of a war with Russia

in the spring of 1885 the biggest liners were armed as auxiliary cruisers, as mentioned in the case of the *Arizona*. The scare was over before the work was completed, but it was decided that, as the Admiralty had gone to considerable expense in the case of the *Oregon*, she should be kept in commission over the manœuvres. There she proved herself superior for scouting and outpost work to any cruiser in the fleet, although her great length and single screw made her very awkward for manœuvring in squadron formation. She then went back to the Cunard Line service, but her career was short, for on March 11, 1886, when off Fire Island, outside New York Bay, she was rammed by an unknown schooner, which is generally identified as the *Charles North*, as that vessel disappeared about the same time in the same waters.

She was hit between the two boiler-rooms, the watertight doors were open and were prevented from closing by coal dust in the sills, and she immediately began to fill. Happily a pilot schooner and the Norddeutscher Lloyd liner *Fulda* arrived on the scene and contrived to take off all her passengers and crew and most of her mails

before she took the final plunge. It is pleasant to note that the Norddeutscher Lloyd refused to accept one penny of compensation for what they had done, although it was freely offered by the Cunard Line, an attitude which was very much appreciated.

CHAPTER XI

THE CUNARD LINE AGAIN

During the 'seventies the Cunard Line was temporarily out of the running on the Western Ocean for first-class express traffic. The Guion liners built by John Elder & Co., at Fairfield, the White Star ships of Harland & Wolff, Belfast, and the Inman vessels beat the Cunarders both in speed, size, and modernity. For some years the Cunard Line was content to build ships that were really in the second grade, and to leave the three companies mentioned to fight for the speed records.

Then the line underwent a reorganisation, and passed from the private ownership of its founders into the hands of a company entitled the Cunard Steamship Co., Ltd., which was incorporated on February 23, 1878, with a capital of £2,000,000. This became a public company

in 1880, when the shares for the first time became available to the investing public, who required no urging to take a financial interest in a steamship undertaking with such history and reputation. Early in 1883 David MacIver & Co. withdrew from the management, which was then assumed directly by the board of directors.

A change of policy at this period was to concentrate on building up a public which required solid first-class comfort and moderate speed as a definite step towards regaining their old premier position, although speed records were still left to the White Star, Inman, and Guion lines. It was on this principle that the *Gallia* was built by J. & G. Thomson, Clydebank, in 1879, a ship which was long a popular favourite with American travellers. She was an improvement on the *Bothnia* and *Scythia* of 1874 and 1875, the measure of improvement being gauged by the fact that her guaranteed speed was half a knot more, and her cost was £156,000 against the £125,000 of the earlier ships. These vessels were themselves considerably longer than most of their rivals, but the *Gallia* was 8 ft. longer and had a greater gross tonnage by 300 tons.

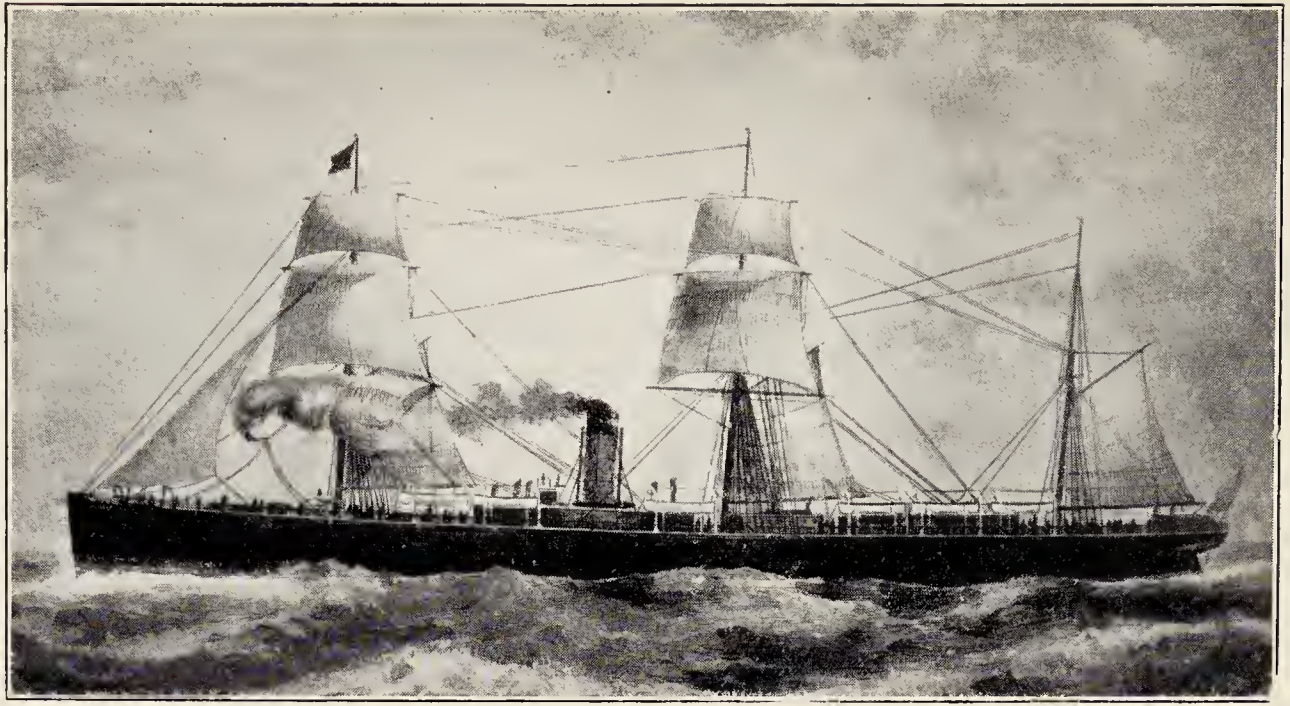
Although that was before the days of auxiliary cruiser subsidies, the Admiralty had a good deal of say in the design of the *Gallia* with a view to her future use as an auxiliary cruiser or a transport, among the measures upon which they insisted being that her bunkers were taken right up to the main deck in order to afford some measure of protection. They also had to approve of her dimensions, which were 430 ft. by 44 ft. 6 ins. by 34 ft. 4 ins., giving her a gross tonnage of 4,809 tons and a displacement at load draught of 9,255 tons.

While she had a certain amount of cargo capacity, 2,350 tons by measurement and 1,685 tons by weight, she was primarily a passenger carrier, and had accommodation for 300 in the saloon and 1,200 in the steerage, certain cabins being interchangeable. The dining saloon was on the spar deck aft, and the passengers were seated at four long tables, the overflow being on the main deck. In those days *suites de luxe* were unheard of, but the Cunard obtained a lot of notice by providing two-berth cabins instead of four-berth, the *Gallia* being unusually well supplied with these. Some of them had dimensions

of no less than 10 ft. by 7 ft., which was regarded as the height of luxury. On the other hand, the vessel only had three baths, two for male and one for female passengers, but even this was above the average.

The main engines were constructed by the builders of the hull, and consisted of a three-cylinder compound set, one 63-in. high-pressure and two 80-in. low-pressure cylinders with a stroke of 60 ins. They developed an indicated horse-power of 5,300, and could be used either for surface condensing or jet condensing. It was only in minor details that the main engines were any improvement on other ships of that day, but they proved themselves conspicuously reliable.

They were fitted with a box-shaped surface condenser, the brass tubes being three-quarters of an inch in diameter by 9 ft. long. The condensing surface was 8,300 sq. ft. The circulating pumps were two Gwynne centrifugal pumps, one being in reserve, and they were also adapted for bilge purposes if necessary, when they were capable of ejecting 15,000 gallons of water per minute.



THE CUNARDER "GALLIA"

Built in 1879 by J. & G. Thomson, Clydebank, for the North Atlantic service.

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"Buenos Ayrean"

An Allan liner of 4,000 tons, built and engined by Wm. Denny & Co., of Dumbarton, in 1879. She was the first steel ship to sail the Western Ocean.

The *Gallia* was very heavily rigged as a barque, and set canvas wherever possible. She was fitted with a well-designed 24-ton propeller with movable blades, the boss being cast iron and the blades steel. Dunlop's pneumatic governor was fitted, and appears to have been successful from the first.

Steam was supplied by eight cylindrical boilers, 14 ft. 6 ins. in diameter by 9 ft. 6 ins. long, having a heating surface of 13,000 sq. ft., with a superheater of 400 sq. ft. In addition, there was an auxiliary vertical boiler, intended principally for pumping purposes, placed high up in the hull of the ship. This had a diameter of 8 ft. and a height of 10 ft. The main boilers worked at a pressure of 75 lb. per sq. in. As has been mentioned, she was intended to be used as a transport if necessary, and her bunkers stowed 1,200 tons of coal, with a further reserve of 500 tons easily accessible in the hold. This gave her a big cruising radius, if necessary, but on North Atlantic service she burned it at a rate of 98 tons per day, or 1·73 lb. per I.H.P. per hour—which was more extravagant than the ships which preceded her.

For a ship built fifty years ago, she was well supplied with auxiliary machinery, notwithstanding the absence of any electric generating equipment. The most important item was the Muir and Caldwell steam steering gear, which was placed on the bridge with the emergency hand gear aft, thus reversing the previous practice.

Her builders guaranteed to the Cunard Line a trial speed of 14⅓ knots, but the mean of her runs over the measured mile on the Clyde was 15·9 knots, and on a preliminary cruise which preceded her commissioning she worked up to 16 knots without much difficulty, and was always regarded as an excellent steamer on service. For some years after she was commissioned the *Gallia* was a most successful vessel on both the New York and the Boston services, but in 1895 she broke her shaft in the Atlantic, and the steamer *River Avon* made a very good salvage out of towing her home. Fitted with a new shaft, she was chartered to the Spanish Government for trooping in Cuba, then in a state of open revolt preceding the Spanish-American War, and when she returned the Cunard had no further use for her. Accord-

THE FAMOUS CUNARD LINER "SERVIA" OF 1881

She had a tonnage of 7,392, and a speed of nearly 17 knots. This ship was the first steel Cunarder and also the first Atlantic steamer of this Line to be fitted with electric light.

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ingly, she was transferred to the MacIver Line for £21,250, in 1897. They wanted her for the Beaver service to the St. Lawrence, which they were trying to revive, but the venture was not a happy one, and in 1899 she was sold to the Allan Line. On her first voyage under their flag she piled herself up near Sorel Point at Quebec, and, although salved, she was regarded as a constructive total loss, and after laying up at Birkenhead for some time was sold to French shipbreakers early in 1900.

The *Gallia* was followed up in 1881 by the well-known liner *Servia*, which, if she was not actually a record breaker, was at least a great success, which secured great popularity on the Atlantic service. She had to meet such competition as the Guion liner *Alaska*, the *City of Rome* of the Inman Company, and the new Norddeutscher Lloyd Clyde-built express steamers, so that particular care was devoted to her design; her plans were under consideration for a long time.

Originally the Cunard specification provided for a ship 500 ft. long with a beam of 52 ft. and a 40-ft. depth of hold, to be built of iron. After

examining this specification, J. & G. Thomson, of Clydebank, suggested a far bigger ship, 530 ft. long with a beam of 52 ft. and a draught of 44 ft. 9 ins. to be built of mild steel. A compromise was reached whereby her length between perpendiculars was made 515 ft., but even so she was the largest merchant ship in the world, always excepting the famous *Great Eastern*, and was the first long Cunarder.

The *Servia* embodied several features that were either entirely or almost novel, including a top-gallant forecastle instead of the usual turtle-back deck, a double bottom for practically her whole length, and coal protection for her engines and boilers, which satisfied the Admiralty so well that they put aside for her an armament of six 64-pounders and four 40-pounders, which were supposed to be capable to being fitted in twenty-four hours.

As finally built, she was a great improvement on the *Gallia*, her gross tonnage being 7,392 tons against 4,809 tons, her trial speed over 17½ knots as against under 16 knots, and her boiler pressure 90 lb. per sq. in. against 75 lb. per sq. in. in the earlier

ship. The *Servia* introduced into the Cunard Line the profile of two funnels and three masts, which remained popular with them for some years afterwards.

The Cunard Line had not yet been converted to the principle of carrying all three classes of passenger in their mail ships, and the *Servia* was fitted to carry about 500 first- and 600 third-class passengers, the accommodation in both classes being capable of considerable increase. At a later date she was fitted to carry second-class passengers only, and the head room of 8 ft. 6 ins. on her passenger deck was regarded as being generous. In those days the water into New York Harbour was none too good, which caused her deadweight capacity to be limited to 5,000 tons on service, although her permissible freeboard would have allowed very much more.

Although this ship was the first steel vessel, and the first with a cellular bottom, of the Cunard Company, she was preceded on the North Atlantic by the 4,000-ton Allan liner *Buenos Ayrean* of 1879, a vessel built and engined by Wm. Denny & Co., of Dumbarton,

which was the first steel ship to sail the Western Ocean.

Another interesting feature of the *Servia* was that she was the first Cunarder to be fitted with electric light. This method of illumination on shipboard had been introduced round about 1879, and was used, apparently for the first time on the North Atlantic in the Inman liner *City of Berlin*, which was so fitted in November, 1879, but its use had not spread to the Cunard fleet until the advent of the *Servia*.

Like the *Gallia*, the main engines of the *Servia* were three-cylinder surface-condensing compounds, by her builders, but they were very much bigger. The design was a combination of the efforts of J. & G. Thomson and Mr. Muir, the Cunard superintendent engineer, and embodied several rather novel features. The diameter of the high-pressure cylinder was 72 ins., and it was placed between the two 100-in. low-pressures, the stroke being 78 ins.

The high-pressure cylinder had piston valves worked by a cam-shaft, the low-pressure cylinders using slide valves. The starting engine was of the combined steam and hydraulic type. The

surface condenser had two 20-in. circulating pumps at either end of the engine, being fitted for jet injection should it be necessary. The total cooling surface was rather more than 15,000 sq. ft. The total length of her engine-room was 42 ft.

The boiler installation consisted of six double-ended and one single-ended boiler. The former were 14 ft. 10 ins. wide, 18 ft. high and 18 ft. 3 ins. long, being made of Siemens steel and fitted with Fox's corrugated flues; each boiler had 556 $3\frac{1}{2}$-in. tubes, each having three furnaces. The total grate area of the boilers was 1,050 sq. ft. and the heating surface 27,000 sq. ft., the boilers working at 90 lb. per sq. in. pressure. The total length of the two boiler rooms was 70 ft., and the total machinery weight 1,800 tons, everything being as substantial as possible.

Perhaps the most interesting item of the liner's auxiliary machinery was the steering gear, whose design was influenced by the number of rudder accidents which had taken place on the North Atlantic about that time. There was a particularly heavy steam steering engine, and as a reserve it had a hand-screw gear, a hand-chain gear and

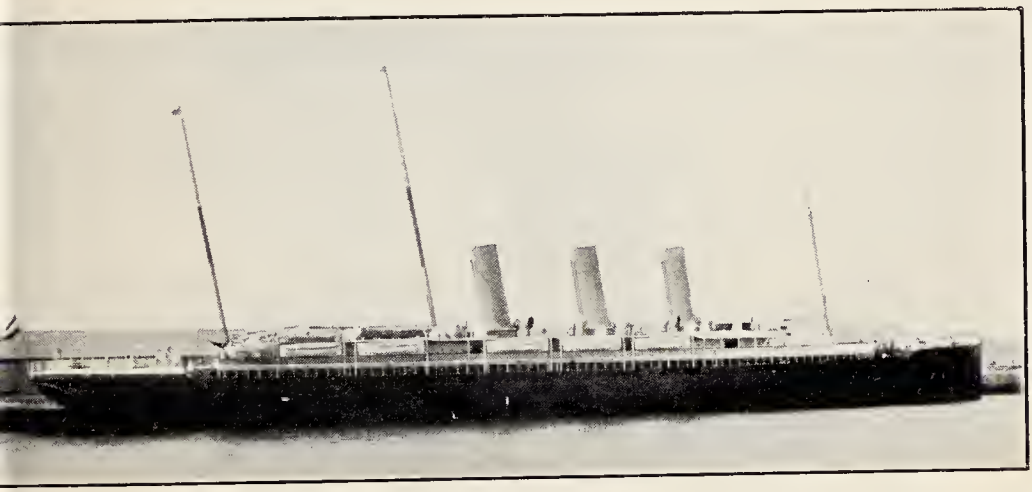
chain tackles. A feed-water air extractor, which had been invented by Mr. Thomson, of the Union Line, was fitted on to the feed pipe, and attracted a good deal of attention.

Originally the crankshaft was a single wrought-iron forging, 25 ins. in diameter, but while the ship was fitting out a flaw was discovered in this, and it was replaced by a three-piece built steel shaft by Vickers, who also supplied the four-bladed 38-ton steel propeller. This substitution delayed the ship's completion considerably, and when finally she went out on her trials in November, 1881, she had five months' fouling. In spite of this she worked up to an average of 17·629 knots with an indicated horse-power of 10,385, the boilers working at 80 lb. per sq. in. pressure and the engine turning at 53 r.p.m.

On her way round to Liverpool to be delivered the *Servia* had a very stormy passage, which proved her an excellent sea boat. Her maiden voyage across the Atlantic, 9 days 16 hours 30 minutes, was made in bad weather the whole way across. In spite of this her best day's steaming was 416 miles. She soon made a great name

THE "ASSYRIAN MONARCH"

Built in 1880 by Earle's Shipbuilding & Engineering Co., of Hull, for the Royal Exchange Shipping Co., of London. She ran on the service between Millwall Docks and New York, and was regarded as the last word in transatlantic emigrant and cargo liner practice



THE HAMBURG-AMERIKA LINER "COLUMBIA"

Built by Laird Bros., Birkenhead, in 1890. She was one of the four vessels with which her owners entered the express service.

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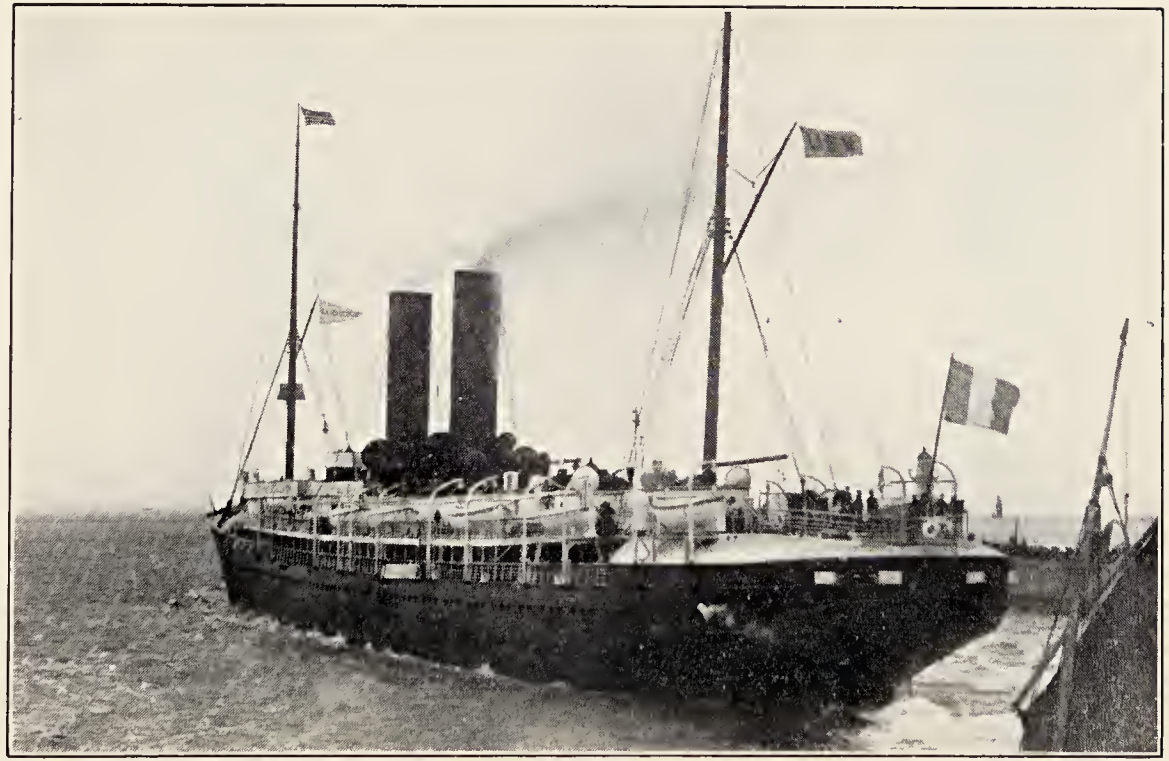

"La Gascogne"

A sister ship to *La Bourgogne*, built in 1886 by Forges et Chantiers de la Mediterranée. She was originally fitted with a triple-expansion engine which was modified at the Penhoët Yard in 1894. Claimed as being one of the earliest applications of the quadruple expansion principle to marine propulsion.

for herself as a comfortable liner and for her qualities as a carrier of fine goods. Her one serious accident was a breakdown in 1891, when she had to be towed home.

When the *Campania* and *Lucania* came out in 1893 the *Servia* was put into the reserve of the New York service and also used on the Boston run. In 1899 she was commissioned as a transport for the South African War, and at the end of that campaign was sent back into the reserve for a few months only, being sold to Thomas W. Ward, Ltd., the scrappers, in 1901, and steaming round to Barrow-in-Furness to be cut down sufficiently to permit her to pass up the River Ribble to their scrapping yard at Preston.

Following the *Servia* came the *Aurania*, which was launched by J. & G. Thomson in 1882. She had the dimensions and particulars as shown on the following page.

A great feature in the *Aurania* was made of the fact that she was lighted throughout with electricity, and that half her passengers could sit down to dine at the same time. She was an improvement on her predecessor, the *Servia*, and

Principal Particulars of the *Aurania*, 1882.

Length b.p.	470 ft.
Breadth, extreme	57 ft.
Depth, moulded	37 ft. 9 ins.
Gross tonnage	7,300 tons
Net tonnage	4,030 tons
Displacement	11,800 tons
Engines	3-cyl. compound
Screws	One
Horse-power	9,000 indicated
Speed	17
Boilers	6 D.E.; 2 S.E.
Pressure	90 lb.
Fuel	Coal (2,500 tons)
Passengers	700*

* Later 1,180.

although not designed for speed she was not by any means a slow ship, and soon contrived to bring her average passage down to about seven days. At the same time it must be admitted that her compound engines, transmitting 9,000 indicated horse-power through a single line of shafting, were rather big in their moving parts, and she had a number of minor breakdowns attributable to this cause. When quite a new

ship, for example, she had the misfortune to break a connecting rod, but at that time she was heavily rigged as a barque (her yards were afterwards unshipped and for most of her career she was a schooner) and she contrived to sail, until picked up by a tug. She still had a number of accidents, most of them connected with her machinery, but the only really serious ones were a collision with the White Star *Republic* in 1885 and a complete breakdown in 1898, which caused a big claim for salvage by the Wilson liner *Marino*.

The propelling machinery consisted of a single set of three-cylinder compound engines capable of developing about 9,000 I.H.P., with cylinder diameters one of 68 ins. and two of 91 ins., having a stroke of 6 ft. There were in all eight circular boilers, 15 ft. in diameter, having 42 Fox's patent corrugated furnaces, working at 90 lb. per sq. in.

At the time of her completion it was stated that she could carry sufficient coal fuel to carry her round the world at 15 knots. She had eleven watertight bulkheads carried up to the upper deck, and could not only fulfil the then-existing

Admiralty condition of being able to float with one compartment filled, but it was claimed that she would be quite safe with any two completely flooded.

After the *Aurania* the Cunard Line decided that the time had come for them to re-enter the lists for the speed record. The Guion Line, who were then the holders, had followed their earlier bad luck with the successful *Arizona* and *Alaska*, and were also building the *Oregon*, with the avowed intention of improving on the *Alaska's* speed, despite the fact that this vessel had brought the crossing down to a figure below seven days, and were apparently in no immediate danger of losing the honours. True, there were rumours of a new Atlantic company which would increase the competition, and this also may have had its share in reviving the Cunard interest in speed. They therefore ordered from John Elder & Co., of Fairfield, the sister ships *Etruria* and *Umbria* which were the last of their great single-screw express liners.

Before either of these vessels was completed the *Oregon* had passed into the Cunard hands and had actually lowered the record flying their

flag. The *Umbria* started on her maiden voyage on October 31, 1884, and the *Etruria* on April 25, 1885.

The *Etruria* was a single-screw, barque-rigged steamer of 8,120 tons on dimensions 501·6 ft. by 57·2 ft. by 38·2 ft. depth of hold. Her engines were particularly interesting, and were the largest compound set that had ever been constructed for a steamer, indicating no less than 14,500 horse-power. They had three cylinders, one 71 ins. in diameter and two low-pressure cylinders of 105 ins. with a 72-in. stroke, and were designed to give her a speed of 20 knots on trial. The crank-shafts were of Vickers' compressed steel. Steam was supplied by nine cylindrical steel boilers 17 ft. long by 16·6 ft. in diameter, with 72 Fox's patent corrugated furnaces. The grate area was nearly 1,700 sq. ft., and the heating surface nearly 39,000 sq. ft. The steam pressure was 1·0 lb. per sq. in. The propeller was a four-bladed one, 24·6 ft. in diameter with a 33·6 ft. pitch, having a blade area of 226 sq. ft., and working up to 68 r.p.m. Originally, the screw was of steel, but in the late 'eighties the blades were changed for manganese bronze.

By the time the company had obtained delivery the bill had run up to £400,000, and there were many doubts expressed as to whether a single ship was worth as much as this. It was realised that she would be an expensive vessel to run, and it turned out that she burned on an average 315 tons of coal a day at full speed, her bunker capacity being 2,500 tons. She was out to attract the higher-priced trade, and had particularly comfortable accommodation for her day, in addition to having electric light fitted throughout the ship, to which due attention was drawn by the company. The Admiralty had a considerable say in her design in return for her subsidy as an auxiliary cruiser designed to carry 4·7 in. and Nordenfeldt guns, insisting that she should be able to steam 16 days at 18 knots, which was very much more than any cruiser in the fleet was capable of doing.

Tried in the Clyde in March, 1885, she worked up to 20·233 knots with 67·5 r.p.m. on a six-hour run, that being deemed quite satisfactory without putting her on to the measured mile. She then steamed round to Liverpool at three-quarter power, and averaged 17·5 knots, so that

the greatest interest was aroused by her advent. In April, 1885, she went on service as already mentioned, and immediately proved herself an excellent steamer, although at the outset she was not quite as fast as the *Oregon*. Shortly afterwards both the *Etruria* and *Umbria* contrived to beat the best times of the former Guion liner.

On May 27, 1888, the *Etruria* left Queenstown for New York with the definite intention of lowering the record. Her time was 6 days 2 hours 27 minutes, her best day's steaming being 503 miles at an average of 20·3 knots. She had previously won the eastward Blue Riband in March, 1887, with a time of 6 days 4 hours 36 minutes. The vessel then settled down as a very comfortable passenger carrier, and on her hundredth voyage in 1893 showed that her speed was still improving. She was one of the ships whose performance steadily increased as she got older, but it was always felt that her engines were putting colossal strain on her single shaft, and a most careful examination was made at the end of every voyage. In 1900 a flaw was discovered, and the sailing was cancelled for a new length of shaft to be fitted, but in 1902 even

this precaution was not sufficient, for on her two-hundredth voyage she lost her propeller and rudder. At the end of the year a flaw was again discovered in her shaft, and it was replaced.

On October 4, 1908, the *Etruria* completed her last Cunard passage, and it was announced that in the company's service she had travelled 1,650,000 sea miles with remarkable freedom from accident, considering all things. She was laid up at Liverpool, and in November, 1909, the company invited tenders for her purchase and that of the *Umbria*.

THE NORDDEUTSCHER LLOYD LINER "ELBE" OF 1881
The vessel with which her owners inaugurated their express service.

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The Norddeutscher Lloyd Single-screw Liner "Lahn"

Built at the Fairfield Yard. She was the last foreign-built vessel before Bismarck's Imperial Mail subsidy scheme

CHAPTER XII

GERMAN PROMINENCE IN THE 'EIGHTIES

It was in the 'eighties that Germany first came into prominence on the North Atlantic from the point of view of speed. The entry of the Guion Line into the class of record breakers had seen the *Arizona*, built by John Elder & Co., on the Clyde, reach the hitherto untouched speed of 16 knots, and this was probably the reason that the Norddeutscher Lloyd decided that they could no longer neglect the possibilities of express service. When the matter was before their board of directors a strong point was made of the patriotic obligation to place orders for the new tonnage with German shipyards. These had never built a passenger vessel of the requisite size, and lacked the experience. After much discussion, it was eventually decided to give the order to the Clyde, whence record breakers so

frequently came, and the single-screw *Elbe* was accordingly contracted for with John Elder & Co., in 1880.

The *Elbe* was a vessel of about 4,700 tons, and was propelled with compound engines. She was finished before her contract time and made her maiden voyage in the summer of 1881. The first-class travelling public immediately liked her, and the five trips made in that year resulted in a net profit of over half-a-million marks—not a bad return on a vessel whose original cost was 2,726,000 marks. With such results it was natural that her owners should increase this type of service, and, when the *Werra* and *Fulda* came out, a weekly express line from Bremerhaven to New York was inaugurated in 1883. Subsequently the *Eider*, *Ems*, *Aller*, *Trave*, and *Saale* were added to the service, and a twice-a-week schedule was started in 1886. These 1885 ships had a tonnage of about 5,400, and were driven by triple-expansion steam engines through a single screw. They were also Clyde-built.

As these vessels were far behind the contemporary British ships of the Cunard, Inman, and White Star Lines, and as competition at that time was

mainly centred on the Blue Riband, they did not attract very much attention, and were taken even less seriously than the French. Their British base was Southampton, which in those days had few claims to notice on the Western Ocean, and the speed record for that run was almost unmentioned. For many years this record was held by the *Main*, a Norddeutscher Lloyd steamer built in 1868 by Caird & Co., of Greenock, like so many other of their early ships, which logged the westward time of 8 days 1 hour. In 1886 this record was lowered by the famous *Aller*, one of the finest looking ships that Fairfield ever turned out, which made a run of 7 days 4 hours 15 minutes from Sandy Hook to the Needles. Her design was developed in the *Lahn*, which cut down the westward passage to 6 days 22 hours 40 minutes.

The *Lahn* was a single-screw four-masted schooner of 5,681 tons, built at the Fairfield yard, and was the last foreign-built vessel before Bismarck's Imperial mail subsidy scheme forced the Norddeutscher Lloyd to go to German yards in order to take advantage of the subsidy. Her dimensions were 448 ft. by 49 ft. by 34 ft. depth

of hold, giving her a gross tonnage of 5,681 and a displacement of 7,700 at 22 ft. draught. Her engines consisted of a five-cylinder set of triple-expansion engines, with two 32½-in. cylinders, one 68 in. and two 85 in. by 72-in. stroke. These were the largest triple-expansion engines built up to that date, and were intended to develop an indicated horse-power of 9,500, to give a speed of 18½ knots. On the measured mile, however, she attained 19·46 knots.

The vessel was designed to carry 224 first-, 106 second-, and 700 third-class passengers, an accommodation that was subsequently completely altered. The first-class dining saloon was forward of the machinery space, and the second-class was on the main deck aft. In the arrangement of ventilation and comfort for the steerage passengers on the lower deck, the *Lahn* was before her time.

She made her maiden voyage in February, 1888, and when she put to sea was exceeded in speed only by the Cunard *Umbria* and *Etruria*, and immediately made herself a favourite on the New York service, establishing the record before she had been in service many weeks. On her

second voyage, however, she was unlucky in that a burst steam pipe killed two and injured four men, while she did herself serious damage at the end of the trip by colliding with the pier at Bremerhaven. The inquiry found that the explosion was due to the copper being rendered brittle by heating during brazing.

The *Lahn* continued to clip minutes off her time, but she was unlucky in a number of minor accidents. In 1901 she was taken off the New York service and put on the company's subsidiary run, but during the war with Japan the Russian Volunteer Fleet bought her and rechristened her *Russ*. She was converted at Libau for use as a captive balloon ship, but did not take any active part in the war. Immediately after it was renamed *Dniester*, and is still on the Soviet Government list.

CHAPTER XIII

THE 'NINETIES AND GERMANY WINS

The 'nineties saw a far keener struggle for the Blue Riband than had yet taken place, and the honours were to pass from country to country and from company to company with great rapidity during this decade. In August, 1889, the Inman & International liner *City of Paris* (No. 2 of that name) made the first Atlantic run in under the six days when she covered a 2,792-mile course from Sandy Hook to Queenstown in 5 days 23 hours and 38 minutes at a speed of 19½ knots. In the last month of the year she reduced her own figure by a few minutes and this record stood when the 'nineties opened.

Then in 1891 the White Star Line brought out their record-breakers, *Majestic* and *Teutonic*, with which for the last time this line captured and held the Blue Riband. These vessels were

565 ft. in length, with a beam of 57 ft. 6 ins. and a depth of 42 ft. 2 ins., their gross tonnage being 9,686. Their reciprocating steam engines had an I.H.P. of 19,500, giving them a speed of about 21 knots. On the westbound run from Queenstown to Sandy Hook, the *Teutonic* made her best time, namely 5 days 16 hours 31 minutes, following this, with an eastbound run in October between the same points, in 5 days 21 hours 3 minutes.

The White Star Line was not allowed to hold these records for more than a bare year, and when the *City of New York* captured the eastward honours in August, 1892, and the *City of Paris* improved upon the best westward time of the *Teutonic*, the White Star Line retired from the class of Riband-holders, and, as we have already seen, adopted the policy upon which the company's great success has now for so many years rested, namely, moderate speed and extreme comfort.

It was just at this time that the two "City" vessels passed to the American flag and lost their "City" prefix in the circumstances which have already been detailed. Then the renewed desire

of the Cunard Line to regain their former pre-eminence in speed, which had been evinced by their last great single-screw express liners, *Etruria* and *Umbria*, caused the line to improve their tonnage. The *Campania* and *Lucania* came from the Fairfield yard in 1893, and speedily regained the Atlantic honours for these shores. These fine vessels, with a length of 600 ft., were the longest steamships in the world, always excepting the old 680 ft. *Great Eastern*, whose dimensions were not to be beaten until the closing years of the century.

The keenest fight of the 'nineties, however, was between England and Germany.

In 1800 the Hamburg–Amerika Line, which until then had interested itself almost entirely in the steerage business, started building express ships in competition with its Bremen rival, laying down the *Columbia* and *Normannia* in England and the *Augusta Victoria* and *Fürst Bismarck* in Germany. At that time, in view of the relations between the two companies, an exciting race was expected. Nor were those who anticipated it disappointed. This began to attract very much more attention to the Southampton route, al-

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THE CUNARDER "LUCANIA" OF 1893

Was built at Fairfield. She and her sister *Campania* were the reply to Inman and White Star competition on the North Atlantic.

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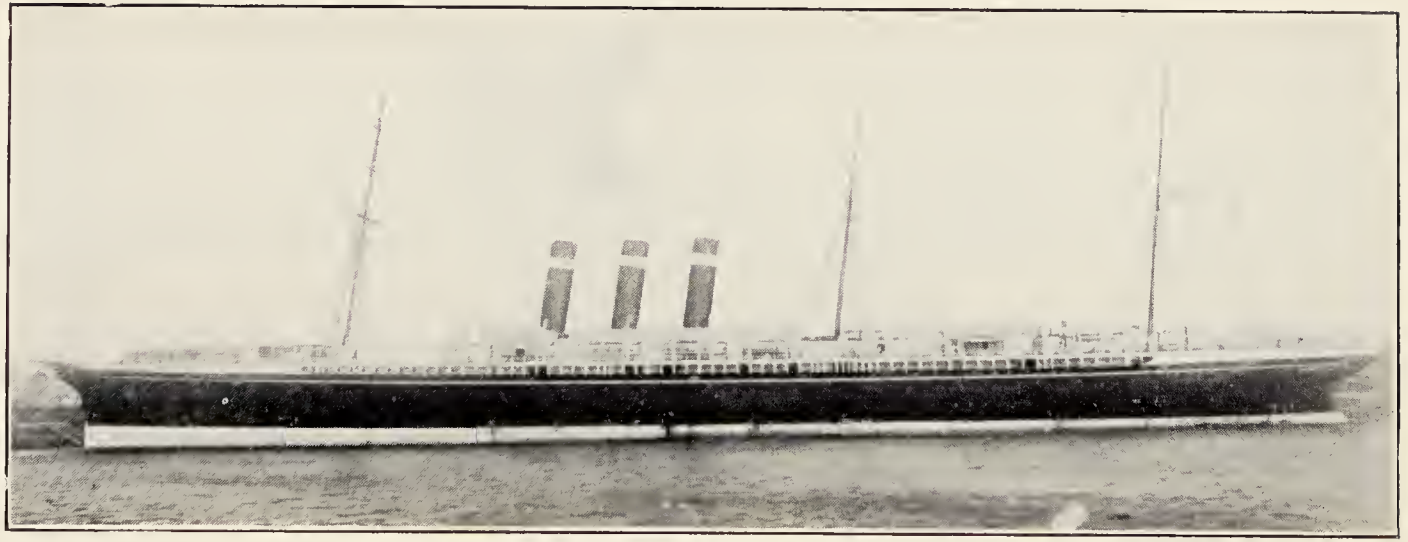


THE RECORD-BREAKING "CITY OF PARIS" (2)

One of the first twin-screw ships. She was built at Clydebank in 1888 for the Inman Line.

though the principal interest was still centred on the race from Liverpool.

The Norddeutscher Lloyd had always been much more anxious to obtain notice in this respect than their Hamburg rivals, and on that account had the cream of the saloon business, while the Hamburg-Amerika Line did very well out of the steerage trade. The Lloyd, however, had been very hard hit financially by the requirements of Bismarck's mail subsidy contract, and the Hamburg firm took the opportunity to slip in and establish themselves on their rival's chosen preserves.

The four ships which they brought out on this occasion were of roughly the same size but differed materially in design, each builder being allowed a free hand. The Vulcan yard at Stettin, then struggling for recognition, built the *Augusta Victoria* and *Fürst Bismarck*, while Laird Brothers built the *Columbia* and Fairfield the *Normannia*. The *Columbia* was a steel twin-screw three-masted schooner with the bow strengthened for navigation among ice, whose dimensions of 463·5 ft. by 55·6 ft. by 35·5 ft. depth of hold gave her a gross tonnage of 7,363. She was a four-decked

ship with eleven bulkheads, having a double bottom for the whole of her length and with her deadwood cut away aft in order to facilitate turning. She had very little cargo capacity, but accommodation for 400 first-, 120 second- and 580 third-class passengers on a scale which was then greatly in advance of western ocean practice and which started the German policy of building luxury liners.

The vessel was propelled by triple-expansion engines, having cylinders 41 ins., 66 ins., and 101 ins. in diameter, with a stroke of 66 ins. The engines were designed for an indicated horse-power of 12,500, and were supplied with steam from nine double-ended cylindrical boilers having fifty-four furnaces. The machinery space was divided into three entirely separate watertight compartments, the German Admiralty having considerable say in this and similar precautionary features of the design with a view to employing her as an auxiliary cruiser in time of war. She was floated out of the dry dock in which she had been built at the end of February, 1889, and tried on the Mersey at the end of June.

Although the contract was only for 12,500 I.H.P. without any guaranteed speed being mentioned, she worked up to 13,800 I.H.P. and averaged rather more than 19 knots. Her owners were delighted with her performance, and she sailed from Hamburg on her maiden voyage to New York in July, 1889.

Her maiden eastern passage was 6 days 19 hours, which was not quite equal to her German-built rival, the *Augusta Victoria*, who again was not admitted to have beaten the Norddeutscher Lloyd *Lahn* by any appreciable margin. She averaged 18½ knots consistently, but the directors were quite convinced that they could get something better out of her, and early in 1890 she was fitted with new propellers.

The result of fitting the new propeller to the *Columbia* was immediately successful, for although the *Augusta Victoria* had succeeded in September, 1889, in clipping a clear eight minutes off the record of the *Lahn*, the *Columbia* beat her within a month on the westward run by over seven hours.

She then lowered the eastward record between New York and Southampton to 6 days 15 hours

58 minutes. She was not to hold the record for long, however, for the Fairfield-built *Normannia* captured the eastward Blue Riband by four hours, and soon afterwards the *Fürst Bismarck* took the westward trophy from her with three-quarters of an hour to spare and then contrived to get the eastward trophy from the *Normannia*. That settled the matter in both directions for some time.

The success of the *Columbia* had convinced the Hamburg–Amerika directors that there was as great a profit to be made out of the saloon as out of the steerage business, and they rapidly improved their fleet during the 'nineties. In 1898, therefore, when it became obvious that war between Spain and the United States could not be avoided, they were glad enough to accept a good offer for the *Columbia* from the Spanish Government, and accordingly she became the cruiser *Rapido*, armed with four 6·3-in., four 4·7-in., and six smaller guns. It was typical of the Spanish dockyards at that period that she was not ready in time to be of any use in the West Indies, and was only just reconditioned in time to join the Reserve Squadron which sailed

in June for the purpose of recapturing the Philippine Islands. They only got as far as Suez when they were recalled.

The complete eclipse of the Spanish Navy after the war rendered both the *Columbia* and the *Normannia*, which had been purchased at the same time, surplus to their requirements, and after negotiating with the Compania Trasatlantica for some time the former was sold back to the Hamburg-Amerika Company in 1899 and resumed her old name and service. They kept her until 1904, when Russia found herself deplorably short of cruisers in her war with Japan and offered the company £200,000 for her. The transfer was soon made, nominally to the Russian Volunteer Fleet, and she was sent to sea as the auxiliary cruiser *Terek*. The only war work that she did was to stop one or two German steamers in the Atlantic, which annoyed the Berlin government very much indeed. In May, 1907, she was sold to Ward's, the shipbreakers, for £21,000, and broken up at Preston immediately afterwards.

In the meantime German shipping had been growing with extraordinary rapidity, and the

directors of the Norddeutscher Lloyd decided that the Atlantic Blue Riband, won on an average speed without any possibility of doubt, was their best method of pushing themselves to the front.

At that time the company had undertaken a very heavy capital expenditure in replacing the older units of its fleet by modern tonnage, and much as it wanted the record it was not in a position to incur heavy financial risk. It, therefore, invited tenders from the principal German ship-yards on what were surely the most onerous conditions known. The trial trip of the new steamers was not to consist of a few hours' run at high speed and various turning and manœuvring tests, but was to include the whole of their maiden voyages to New York and back. At the end of the voyage, unless the company's requirements were satisfied in every possible particular, it had the right of rejection.

The Vulcan yard at Stettin and the Schichau yard at Elbing accepted these conditions, building the *Kaiser Wilhelm der Grosse* and the *Kaiser Friedrich* respectively. The builders had a very considerable say in the design of the ships, which

were on quite different lines. The *Wilhelm* had one of the most graceful hulls ever put into the water, rigged as a three-masted schooner with four funnels in pairs, and the *Friedrich*, while having pleasing lines, was much more solid looking with her three funnels and two masts.

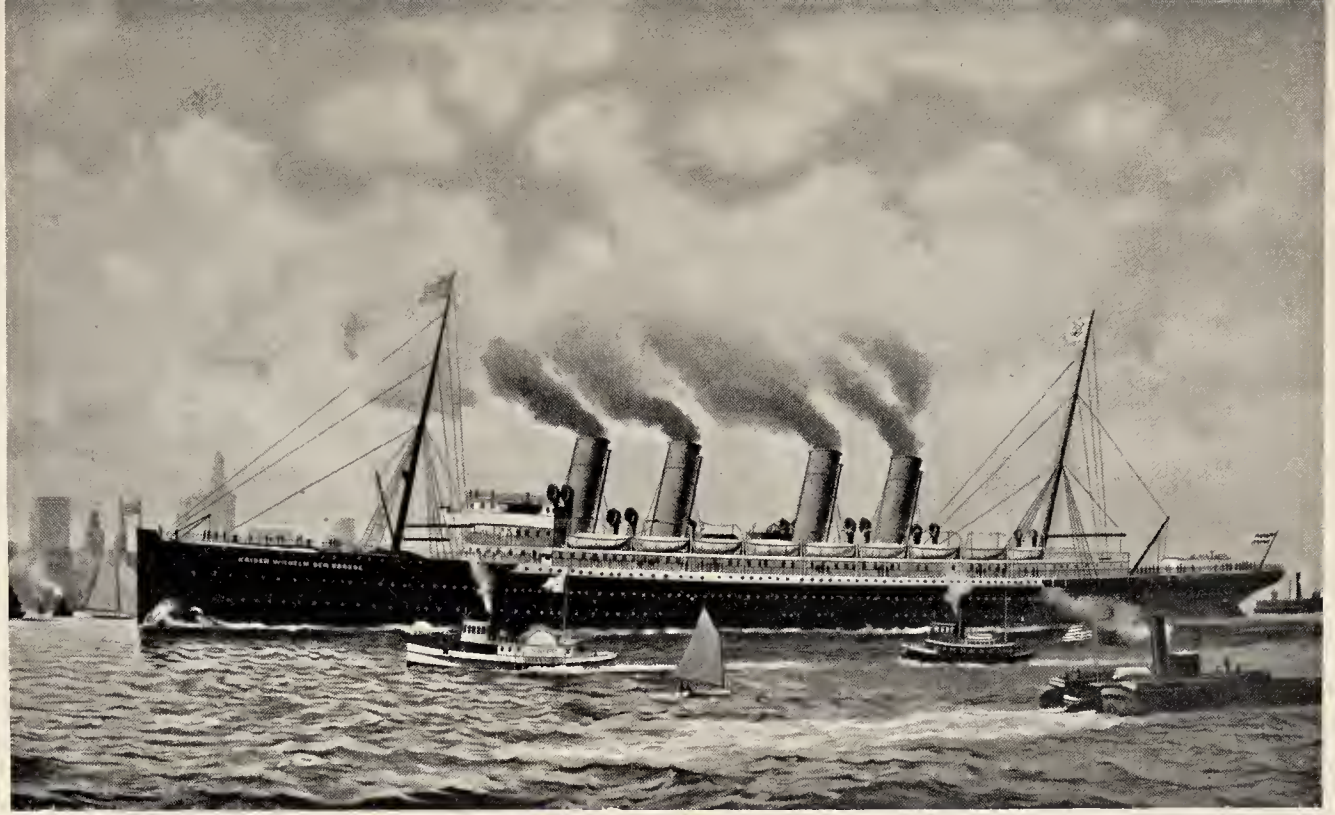
The first of these new twin-screw steamers to be completed was the *Kaiser Wilhelm der Grosse*, which was launched on March 4, 1897, in the presence of about 30,000 people. Her tonnage was 14,349 gross, with a displacement of 21,000 tons, the propelling machinery consisted of two sets of four-cylinder triple-expansion engines developing no less than 30,000 horse-power, and giving a speed of 22½ knots.

The *Kaiser Wilhelm der Grosse* was away on her maiden voyage before the *Kaiser Friedrich* was launched. After attracting a lot of attention on the way down she put into Southampton for her British passengers and to afford the British some opportunity of seeing the ship. She passed the Needles at 2 a.m. on September 21, 1897, and arrived at Sandy Hook at 7.45 on the 26th, a passage of 5 days 22 hours 45 minutes, with

an average speed of 21·39 knots, which was faster than the *Lucania's*, while her best day's run of 564 miles was also a record. Her homeward passage was at an average of 21·94 knots, while the averages of her third round voyage were 22·35 and 22·83 knots respectively.

The first passage of the *Kaiser Friedrich* was 7 days 11 hours; coming back it was 9 days 2 hours. Although she improved on this passage considerably her builders took her back and did not dispose of her until 1912, when the French bought her for the South American service, only to lose her as a victim of the German submarine campaign during the War.

Meanwhile, the Hamburg-Amerika Line was expanding even more rapidly than the Norddeutscher Lloyd, and was regarding the latter's record with very jealous eyes. Accordingly, the famous *Deutschland* was laid down to rival the Bremen flyers and was launched in January, 1900. On trial she contrived a speed of 23½ knots and on her maiden voyage she did 3,044 miles in 5 days 15 hours 36 minutes, which worked out at an average of 22·42 knots. She held the record



The Norddeutscher Lloyd Company's 13,952-ton twin-screw express liner, *Kaiser Wilhelm der Grosse*, of 1897, with which Germany captured for the first time the North Atlantic honours

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THE WHITE STAR LINER "OCEANIC"

Which gained a reputation as a "comfort" ship about thirty years ago. She was b
at Belfast in 1899 by Harland & Wolff.

THE CUNARDER "IVERNIA"

Which came from the yard of C. S. Swan & Hunter in 1900, was among the first n
worthy ships to be fitted with quadruple-expansion engines.

for a time, but, although she was brilliant on some passages she was not a consistent performer, her first ten voyages varying between 5 days 8 hours 35 minutes and 7 days 5 hours 40 minutes.

In the meantime the Norddeutscher Lloyd were not content to let their laurels slip from them and laid down the *Kronprinz Wilhelm*, which made a name for herself as a corsair cruiser during the War. The vessel was similar to the *Kaiser Wilhelm der Grosse* but was 15 ft. longer. Her maiden voyage, in 1901, averaged 23·01 knots and for a long time there was the keenest and bitterest controversy between the *Deutschland* and this ship, although finally the *Kronprinz Wilhelm* proved the victor in 1902 with an eastward average of 23·47 knots, followed by a westward passage at 23·09.

Almost immediately afterwards came the *Kaiser Wilhelm II*, a very much bigger ship of 19,361 tons, with four sets of quadruple-expansion engines, two to each shaft. In June, 1904, she won the eastward record at an average of 23·58 knots, while her 564 miles in the day also stood

as the world's best. She also lowered the westward passage.

Finally, in August, 1907, the last and biggest ship of the quartette was put on service, the *Kronprinzessin Cecilie*. The new Cunarders were then still regarded as something of a mystery and the Norddeutscher Lloyd took their time in letting the *Kronprinzessin Cecilie* work down into her speed, with the result that although she proved herself a very fast vessel from the first, and in the long run the fastest possessed by Germany, she had not beaten her consorts before the *Lusitania* and *Mauretania* arrived on the scene.

The *Kronprinzessin Cecilie*, built by the Vulcan yard at Stettin in 1906, had a gross tonnage of 19,503, and a designed speed of 23½ knots, with four 4-cylinder quadruple-expansion engines. For this tonnage her dimensions were 685·4 ft. by 72·2 ft. by 40·5 ft. depth of hold, being a twin-screw ship with four funnels arranged in pairs, after the German fashion. Her hull was minutely sub-divided, both for the purposes of safety and for her secondary function as an auxiliary cruiser.

She was fitted with seventeen transverse bulkheads and a longitudinal bulkhead in the engine-room, while twenty-four of her watertight doors were fitted with the Stone-Lloyd closing apparatus, and the double bottom was divided into twenty-six entirely separate compartments.

As an auxiliary cruiser, the vessel was designed with her rudder and steering gear well below the water line, and it was intended that in wartime she should carry eight 5·9's, four 4·1's, two 3·4's, and 16 light quick-firers and machine guns. In addition, she was fitted to hoist two small torpedo boats with 16 torpedoes in dropping gear. Her huge quadruple-expansion engines had cylinders 37·4, 49·2, 74·8 and 112·2 in. in diameter, with a stroke of 70·9 in. Each set was self-contained, but two worked on each shaft.

The high-pressure cylinders were mounted tandem above the first intermediate cylinders, and the four great engines were very carefully balanced. Designed for a total indicated horse-power of 45,000, they were the most powerful engines afloat, except for those of the

Lusitania and *Mauretania*, who were her contemporaries.

These engines were supplied with steam from twelve double-ended and seven single-ended boilers, with 124 furnaces in all, working at a pressure of 225 lb. per sq. in., and being fitted with four entirely separate boiler-rooms. The total grate surface was 3,123 sq. ft., and the heating area 107,643 sq. ft., or just over two and a half acres. The total weight of her boiler installation in working order was no less than 2,800 tons. Her permanent bunkers carried 5,600 tons of coal, which she burned at the rate of 700 tons a day.

The *Kronprinzessin Cecilie* was launched at Stettin on December 1, 1906, her sponsor being the Crown Princess of Germany, after whom she was named. The discussion concerning the new Cunard liners caused her completion to be delayed somewhat, and it was not until July, 1907, that she completed satisfactory trials and went round to Bremerhaven to prepare for her maiden voyage.

She was not pressed on her first outward passage, but averaged 21·8 knots from Cherbourg to New

York, with a best day's run of 554 miles. Homeward, she averaged 22·65 knots, and in the summer of 1908 broke the record from New York to Cherbourg with an average speed of 23·21 knots, after which she consistently contrived to clip minutes off her own record, but was unable to equal the speeds of the two new turbine-driven Cunarders.

At the end of July, 1914, the famous N.D.L. liner left New York for Bremen with over £2,000,000 in gold on board, but was warned, by wireless, of the outbreak of war, and, after disguising herself at sea, contrived to get back to Bar Harbour, Maine, without being intercepted. In doing so, she broke her own westward record, but that was little consolation. The anchorage there being a poor one, she was a constant source of anxiety to her owners, but dared not venture outside the three-mile limit, as British cruisers were waiting for her. Finally, a safe conduct was given for her as far as Boston.

There she was seized when the United States came into the War, and was re-named *Mount Vernon*, to be given four 5-in. and four light

guns, and to be commissioned as a cruiser transport. She had been allowed to get into a bad condition, and about $1,000,000 was spent getting her ready for sea, after which she proved herself a most valuable troopship, both during the War and after the Armistice. In 1919 she was sent out to Vladivostok to collect returnin gprisoners of war, of whom she brought over 4,000 back to Europe. After that she had various minor adventures, until in the summer of 1920 she was turned over to the Shipping Board with the other United States transports. She was to have been allocated to the United States Mail Line, but that concern went into the bankruptcy court before it could take delivery.

The ship was laid up at Boston from 1920 to 1924, being given the provisional name of *President Jackson*, to which she was never officially transferred, and undergoing periodical surveys to see whether some use could not be made of her. A scheme to spend $8,000,000 to fit her to run alongside the *Leviathan* was put forward and abandoned in 1923, after which similar schemes were regularly suggested and just as regularly dropped. Since then her fate has been the

subject of innumerable discussions and bickerings, for it is acknowledged that her machinery will have to be replaced if she runs again as a first-class liner, and geared turbines, turbo-electric propulsion diesel machinery have all been suggested for the vessel.

CHAPTER XIV

THE MORGAN SHIPPING COMBINE

Memories of her former greatness in the days of sail still lingered in the United States, and the fact that she was unable to make an outstanding success in the North Atlantic trade with her own shipping lines led up to a different form of attack from a new angle, namely, that of finance. American financiers at this period had wide experience in really big companies, syndicates and combines, probably far greater than those in any other country. At a time when England was amazed at the promotions of Henry John Lawson and Ernest Terah Hooley because their companies had capitals of seven figures, industrial groups in the United States boldly came into being with sums up to $1,000,000,000.

Chief among these transatlantic financial giants was J. Pierpont Morgan, who had successfully

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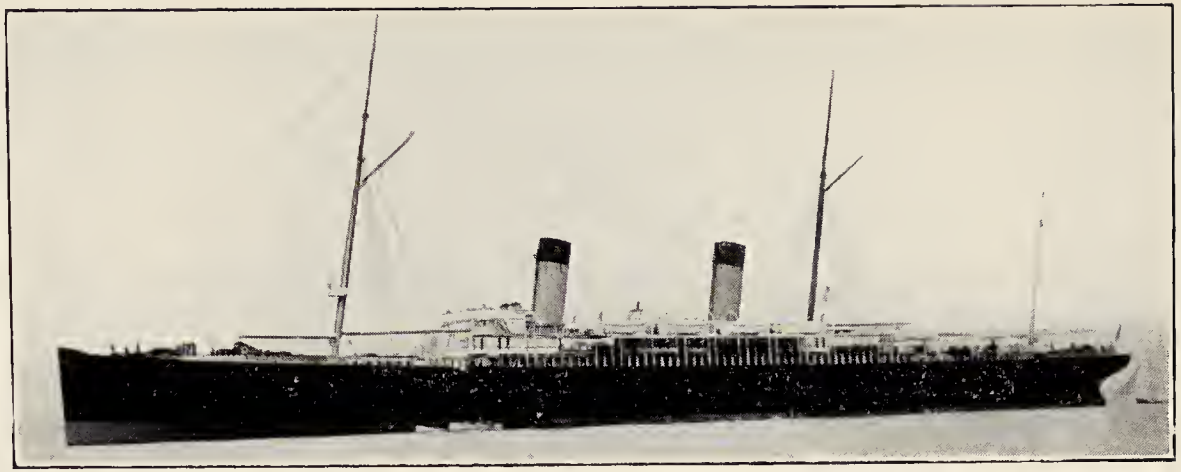

"TEUTONIC"

Was built for the White Star Line by Harland & Wolff, Ltd., at their Belfast yard. She and her sister-ship, *Majestic*, were of 9,686 tons gross, and both vessels made some splendid record runs in the early 'nineties. The *Teutonic* was the last White Star liner to hold the Blue Riband.

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THE "CARMANIA"

One of the first turbine-driven liners. She was built for the Cunard Line in 1905, by John Brown and Co. Ltd., of Clydebank.

handled the formation of the United States Steel Corporation, the International Harvester Co., and many other great combinations. It is generally held that Morgan had had an eye on the Atlantic shipping trade as early as 1893, but it was not until nearly ten years later, when he had completed the organisation of the United States Steel Corporation, that any definite steps were taken.

Having acquired a controlling interest in the International Navigation Co. (American & Red Star Lines), he proceeded to make that company the nucleus of a combine embracing as many of the Atlantic shipping lines as it was possible to secure. It was never seriously contemplated that the Cunard Company would join, even had their British mail contract enabled them to do so.

In January, 1902, Morgan convened a conference in New York of the British and American shipowners in the Atlantic trade to consider the position and prospect of the trade. The British representatives were Mr. J. Bruce Ismay (White Star), the Right Hon. W. J. Pirrie (Harland & Wolff), Mr. Henry Wilding (Leyland), Mr. Graves

(White Star), and Mr. John Dickinson. The American representatives were Mr. J. Pierpont Morgan, Mr. Peter Widener and Mr. C. A. Griscom (American Line), and Mr. B. N. Baker (Atlantic Transport Line). Provisional agreements were entered into on February 4 and summaries of the general agreements published in April.

When it became known that the White Star Line was to be sold to the American group, a public sensation followed what was regarded as a blow directed at the foundations of the British mercantile marine. Other fleets mentioned in connection with the transaction, such as the Atlantic Transport and Leyland companies, did not strike public imagination quite so forcibly, but the White Star name was so well-known, and commanded such general respect that an outcry resulted.

In consequence, the stipulation was made that the sale of the shares in the various operators should be subject to the provision that the companies and their fleets should remain British in ownership, directorate, officers and crews, unless the British Government consented to a transfer

to the American flag, which, at the very least, was unlikely.

American sentiment and the desire to build up a large mercantile marine was thus countered by British public opinion and the restricting action of the British Government. Nevertheless, the scheme was continued, but it left the American interests in the position of shareholders, who could, and did, exercise considerable influence in policy and shipbuilding programmes, but yet were mere shareholders.

The title of the International Navigation Co. was changed on October 1, 1902, to the International Mercantile Marine Co. with a share capital of practically £25,000,000. It took over:

1. All the shares, being 750 of £1,000 each, of the Oceanic Steam Navigation Co., Ltd. (White Star Line), and also the business of Ismay, Imrie & Co., the agents of the line.
2. All the shares of the Dominion Line (the British & North Atlantic Steam Navigation Co., Ltd., and the Mississippi & Dominion Steamship Co., Ltd.), and also the business

of Richards, Mills & Co., the agents of the line.

3. International Navigation Co. (American & Red Star Lines).
4. The capital stock of the Atlantic Transport Co., Ltd., and the Atlantic Transport Co. of West Virginia.
5. A controlling shareholding in Frederick Leyland & Co., Ltd.

Expressed in the simplest terms, the purchase of the White Star and other companies became merely an investment for the American "Combine." That was not the original intention, in which there figured sentiment and a desire to build up a large American mercantile marine. But, as indicated, these designs were countered by British public opinion and the restricting action of the British Government. The United States became in possession of the capital of British shipping companies which, except in the unlikely event of the grant of permission of the British Government, must always remain British. As owners they could, and did, largely control their policies. As owners of the capital, the final word as to the

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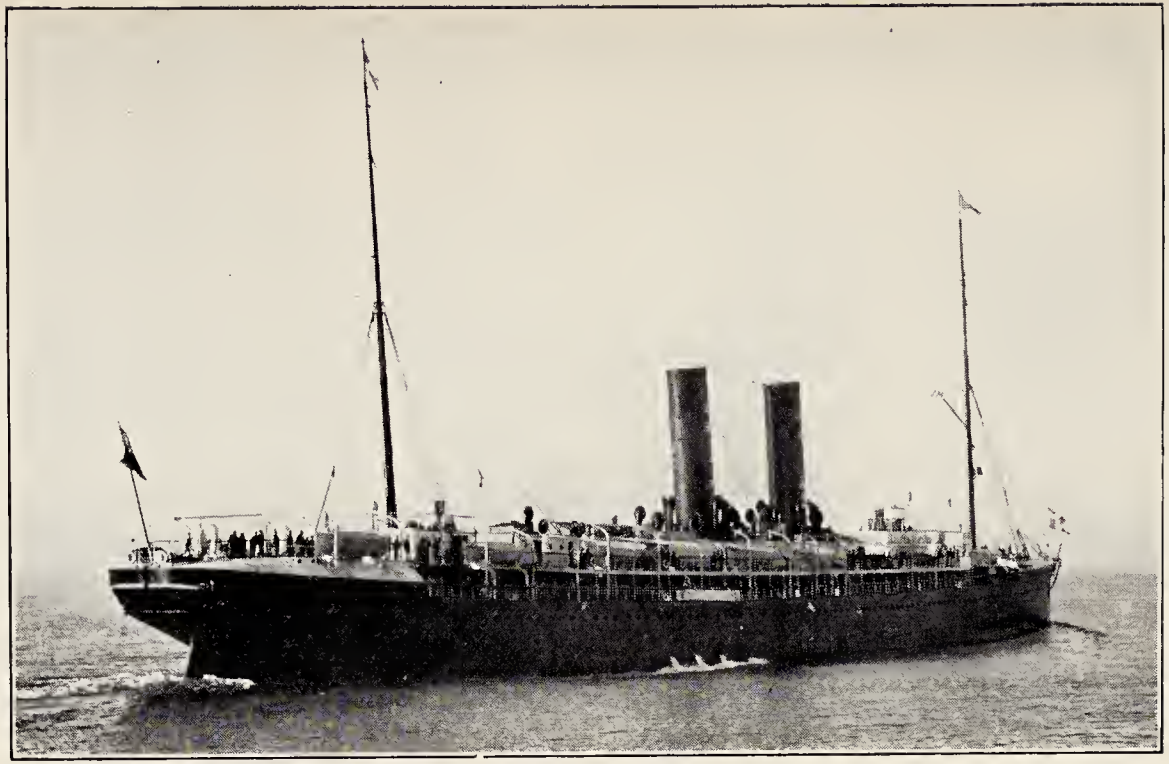

"La Champagne"

Built at Penhoët in 1885 for the C.G.T., this vessel and her sister, *La Bretagne*, were 495 feet long, 52 feet broad, with six-cylinder compound three-crank engines, and were of 6,900 tons gross.

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The famous 18-knot Allan Liner, *Victorian*, one of the first turbine-engined vessels on the North Atlantic. This pioneer of 11,000 tons was built in 1904 by Workman, Clark & Co., Belfast.

shipbuilding programmes rested with them. Always in the background was the International Mercantile Marine Company.

The European War somewhat changed conditions. It brought a measure of prosperity to the International Mercantile Marine Company which, owing partly to over-capitalisation, had been encountering most difficult times. The United States became possessed of a large number of German liners which sought shelter in her ports when she was neutral, and the possession of these, coupled with the impetus given to shipbuilding within her borders, gave her a new place in North Atlantic shipping. Yet the International Mercantile Marine found itself prohibited from acquiring any of the numerous liners owned by the United States Government because of its financial interests in British shipping.

Then, since there were evident advantages to the International Mercantile Marine Company in a disposal of its holding of capital in the British companies, a series of negotiations for sale began. On one occasion President Wilson intervened, although the benefit to the United States of owning the capital of the companies was not at

once apparent. The Royal Mail Steam Packet Company was early in the negotiations, which were not concluded. Then in the earlier months of 1926 there came the discussions with a British syndicate in which Furness, Withy & Co., Ltd., was the principal shipping interest. At the last, hitches to an agreement intervened. Finally, there came the sudden announcement in November, 1926, that agreements had been concluded with the Royal Mail Steam Packet Company, who were to buy the White Star Line. So the control of this honoured name returned to British hands under the chairmanship of Lord Kylsant, and as he is also at the head of Harland & Wolff, Ltd., the sixty-year successful association between these owners and builders is assured of continuing.

CHAPTER XV

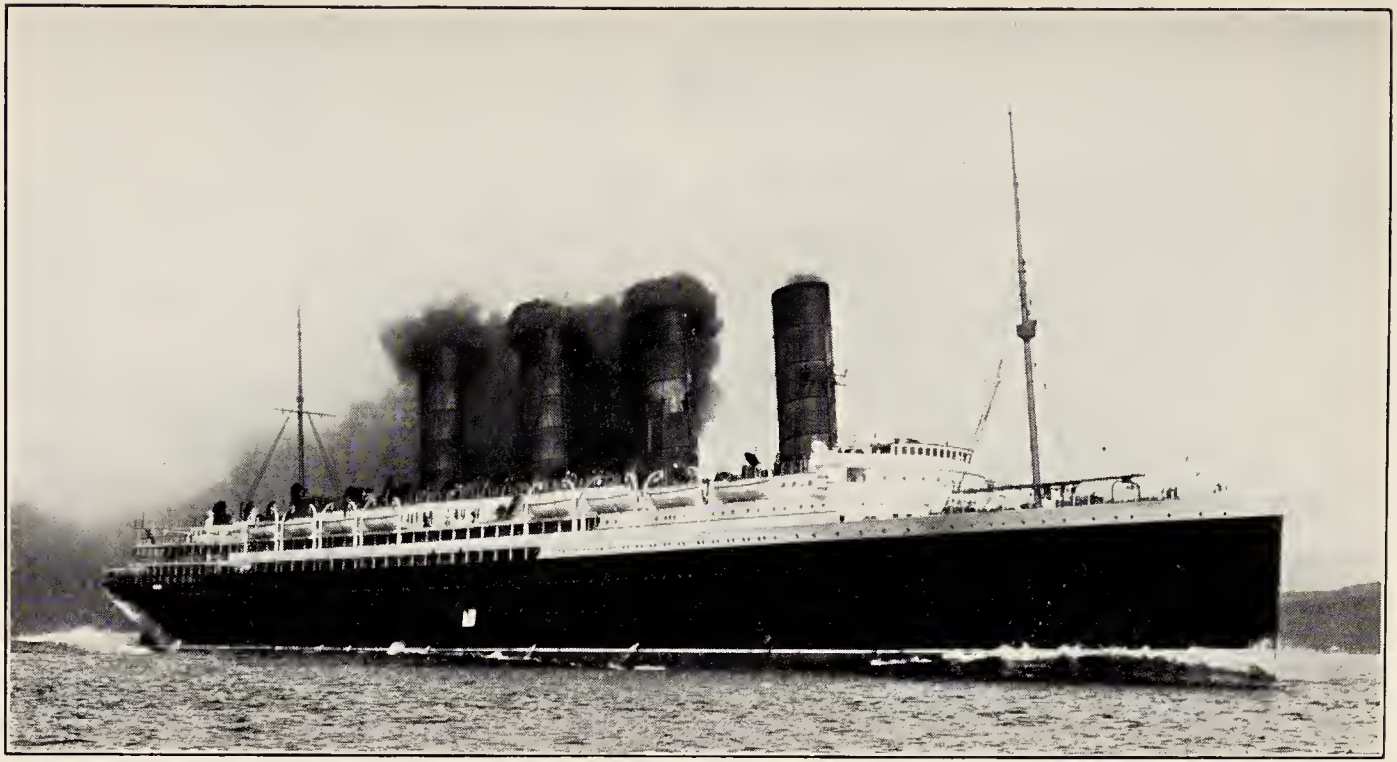
THE BUILDING OF THE CUNARDERS

The success which had attended the German-built liners in the closing years of the nineteenth century very naturally occasioned both surprise and indignation throughout the country, and in consequence the Admiralty appointed a committee to whom they stated that as the fastest ships now in the mercantile marine were not registered as British vessels, the time had come to reconsider the principles on which subsidies were being given to British steamship companies for the retention of merchant cruisers with a view to securing

1. Greater horse-power, and therefore greater speed.
2. That merchant steamers once subsidised should not pass to a foreign flag without the consent of the Board of Admiralty.

This second clause was the result of the fears which were then fairly generally felt that the formation of Mr. J. Pierpont Morgan's International Mercantile Marine Co. would result in the control of British ships on the North Atlantic passing into American hands; this combine, as we have seen, had then already secured a controlling interest in a number of well-known lines, and Mr. Morgan's great reputation in connection with American industrial mergers suggested that a far greater measure of success would attend the efforts towards a shipping combine than actually took place.

The Admiralty Committee consisted of five members, namely, one representative each from the Admiralty, the Treasury, the Post Office, and the Institution of Naval Architects, under the chairmanship of Lord Camperdown. Sir John H. Biles represented the Institution of Naval Architects, and played a prominent part in the work of the committee. He had been intimately connected with the Atlantic liner problem since 1880, and was able to contribute to the committee's deliberations a close knowledge of both the constructional and experimental work which



THE "LUSITANIA"

Built at Clydebank in 1906. This Cunarder and her world-famous sister, *Mauretania*, placed the Atlantic record at a figure which the German fliers could not approach.

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THE FAMOUS TYNE-BUILT CUNARDER "MAURETANIA"

had been carried out over a quarter of a century.

The results of the committee's work were expressed in the following table, giving the subsidy which was believed would be necessary in order to obtain the speeds named:

Average Ocean Speed	First Cost Building, &c.	Engine Power.	Annual Subsidy
Knots	£	I.H.P.	£
20	350,000	19,000	9,000
21	400,000	22,000	19,500
22	470,000	25,500	40,500
23	575,000	30,000	67,500
24	850,000	40,000	110,500
25	1,000,000	52,000	149,000
26	1,250,000	68,000	204,000

The consequences of this report were far-reaching, resulting in action on the part of the Admiralty which regained the Blue Riband for the British Flag and enabled it to be retained for two decades.

The Admiralty entered into a contract with the Cunard Company to build two ships, capable

of obtaining a minimum speed of not less than 24½ knots in moderate weather. For this the Company was to receive a subsidy of £150,000 per year and a loan of £2,500,000 at 2¾ per cent. These vessels were the *Lusitania* and *Mauretania*.

The orders for these two vessels were placed respectively on the Clyde and Tyne, the *Lusitania* being built in the yard of John Brown & Co., Ltd., Clydebank, and the *Mauretania* by Swan, Hunter & Wigham Richardson, Ltd. Few yards were equipped to tackle jobs of this magnitude, and therefore instead of "feeling" as between the various builders the question resolved itself into intense though friendly rivalry between the two rivers, as to whose production, of what were in effect sister ships, should prove the faster and more economical in service.

So far as Swan, Hunter's were concerned, they had been engaged upon calculations in connection with a new Cunarder since 1901 when plans were submitted by them to the Cunard Company for a ship 700 ft. long, to steam 24 knots. The matter was left until about September, 1902, when the agreement already referred to having

been conditionally arranged between the British Government and the Cunard Company, it was necessary to aim at a higher speed. At the beginning of 1903, the proposals of both Swan, Hunter and of Vickers, Sons & Maxim, Barrow, were provisionally adopted. The Tyneside firm proposed a vessel 760 ft. by 80 ft. by 60 ft., while the Barrow firm put forward a design with a beam of 2 ft. less. Both ships were intended to be propelled by three sets of tandem quadruple-expansion five-cylinder reciprocating engines capable of developing together over 60,000 I.H.P.

Shortly afterwards, John Brown & Co., of Clydebank submitted plans for a vessel of 725 ft. by 80 ft. Extensive experiments were carried out at Haslar under the direction of R. E. Froude, and as a result, a complete design was got out for a vessel 760 ft. between perpendiculars by 87 ft. 6 ins. beam. The increase in dimensions made it difficult for the Barrow company to tender, one of the reasons being that the docking facilities at Barrow did not enable them at that time to deal with ships of such a beam as was being favoured.

The choice of propelling machinery to give the desired minimum speed of not less than 24½ knots was by no means easy. Of necessity it lay between the various forms of steam machinery, as at this period the sea-going motorship was unheard of. The decision lay between the reciprocating engine and turbines; the former type was thoroughly well established and had held the field for a quarter of a century or more; whereas in the case of turbines, Sir Charles A. Parsons' great invention, had been first applied for marine work to the experimental vessel *Turbinia* as recently as 1897. The results thus far obtained had shown sufficient reliability and economy to justify their consideration for the new Atlantic liners, but as the system had only been applied to small cruisers and Channel steamers, the merits of turbine propulsion had to be considered almost entirely on theoretical grounds without the benefit of experience in ocean-going, though smaller, liners. The deciding factors were two; first, that it was extremely difficult, if not impracticable, to obtain the contract speed with the world-tried reciprocating engine; second, even if success were achieved in this way, the vessels were liable to

be beaten within a year or two by others with turbine propulsion if the latter should prove suitable for Atlantic ships. After full consideration, therefore, it was decided to fit the new liners with turbines.

At this time the Cunard Company was building a large reciprocating-engined ship, the *Caronia*, 660 ft. by 72 ft., gross tonnage 21,000, 22,000 horse-power, and speed on trial 19·6 knots.

They placed an order for a duplicate of the *Caronia* in size and form with 23,500 horse-power, and decided to install turbine machinery. This vessel, the *Carmania*, was completed in November, 1905, before the *Lusitania*, which was completed in 1907. The experience gained by adopting turbines in the case of the *Carmania* may have done something to help the *Mauretania* and *Lusitania* to a successful result.

The *Mauretania* was launched on September 20, 1906, in the presence of an enormous crowd of spectators, the naming ceremony being performed by the Dowager Duchess of Roxburghe. The vessel was completed in a little less than a year from the date of the launch, and left the Tyne on September 17, 1907, on a preliminary

trial which lasted until the 21st, and throughout gave every promise of the satisfactory and successful career which was in front of her. She then returned to the builders' yard for the finishing touches, and finally left the Tyne for Liverpool on October 22.

She left the Mersey port on the morning of November 3 to run her official trials, and after a trip north to Corsewall Point in Wigtownshire, entered upon the 48 hours' steaming trial at 8 o'clock in the evening. The course mapped out was from Corsewall Light to the Longships, Land's End, and this was traversed by the vessel four times. The result achieved exceeded all expectations, a mean speed of 26·04 knots being maintained for the whole distance. The speeds in the four different runs were as follow:

1st Run.	Corsewall Point to Longships	26·28 knots
2nd Run.	Longships to Corsewall Point	25·26 knots
3rd Run.	Corsewall Point to Longships	27·36 knots
4th Run.	Longships to Corsewall Point	25·26 knots
	Average speed over trial	26·04 knots

After completing the long trial on the evening of the 5th, the vessel proceeded north, and anchored off Wemyss Bay. On November 6, she proceeded to the measured mile at Skelmorlie, where she maintained her reputation by attaining a speed of no less than 26·75 knots on the best pair of runs.

The principal particulars of these express Cunarders were:

	Lusitania	*Mauretania*
Length . . .	760 ft.	760 ft.
Breadth . . .	87 ft. 6 ins.	87 ft. 6 ins.
Draught (mean ocean) .	32 ft. 6 ins.	32 ft. 6 ins.
Displacement at above draught . . .	36,500 tons	36,500 tons
Block coefficient . .	·592	·592
Weight of hull . .	20,145 tons	19,758 tons
Weight of machinery .	9,936 tons	9,402 tons
Speed on trial . .	25·62 knots	26·04 knots
Shaft horse-power on trial.	76,000	78,275
Coal in permanent bunkers	6,029 tons	6,354 tons

The outstanding performance of the *Mauretania*, both during her trials and subsequently throughout her notable career, was indeed a tribute alike to her builders, and to the builders of her engines

(the Wallsend Slipway & Engineering Co., Ltd.), but if one name were to be selected as particularly outstanding it would be that of Andrew Laing, C.B.E., who designed the machinery which (with the exception of that of the *Lusitania*), exceeded by 75 per cent, the greatest power installation previously fitted on board ships.

The principal speed performances of these famous sisters are shown in the table on pages 235-6. The fate of the *Lusitania* so shook the world that details are still fresh in everyone's mind of how she was torpedoed and sunk off the Old Head of Kinsale on May 7, 1915, by the German submarine, U20, with a loss of 1,198 lives.

The *Mauretania* is happily still with us as a lasting tribute to the British genius which designed and built the one vessel capable of holding the Blue Riband for two decades, a vessel that, after being converted to oil burning in 1922, was still able to add to her laurels.

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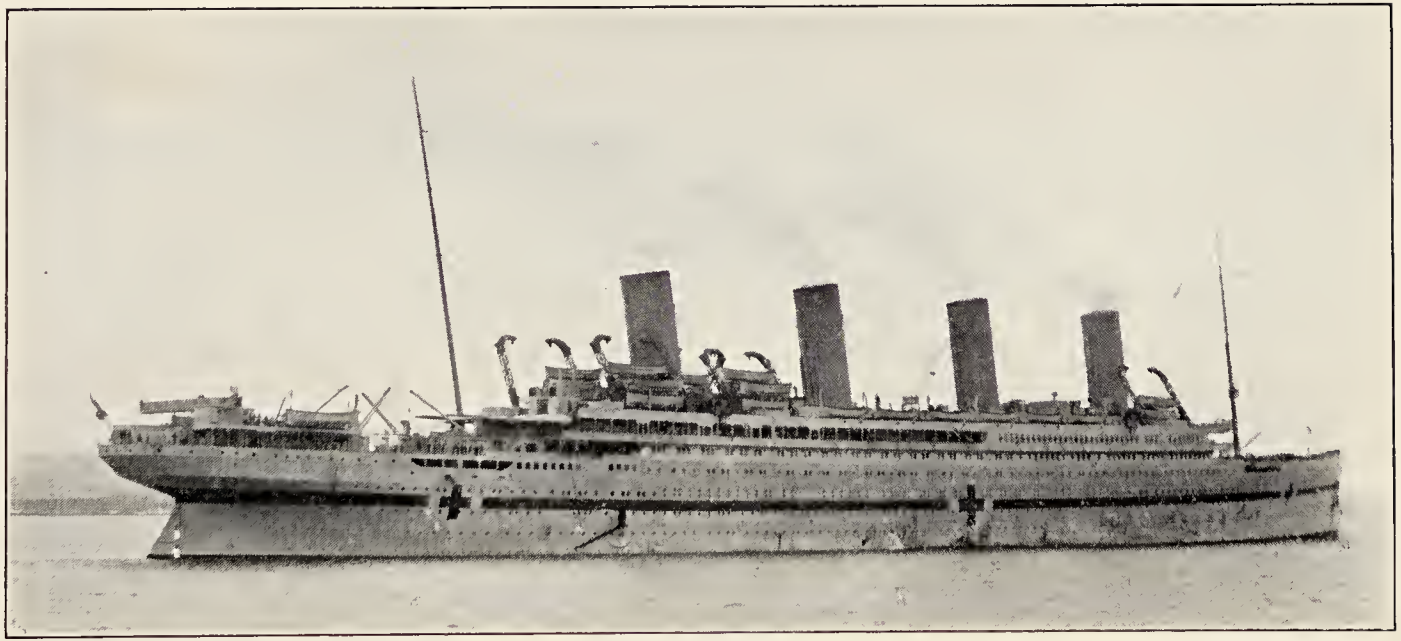
THE "OLYMPIC"

Built by Harland & Wolff, Ltd., in 1911. She set a new standard of passenger comfort on the White Star Line's New York Service.



THE SECOND "BRITANNIC"

Which was building at Belfast when the War broke out. She was hastily completed in 1915, and commissioned as a hospital ship, in which capacity she performed meritorious service, until being sunk in the Ægean Sea in November, 1916.

CHAPTER XVI

THE WHITE STAR EFFORT AND THE "OLYMPIC"

We have seen that on more than one occasion the White Star Line has put up a good fight for eminence on the Atlantic, but never have they made such a bold effort as when they decided to lay down the wonder vessel, *Olympic*, which, it was generally conceded, would mark the commencement of a new era in the story of ships and the sea. This time the object was size and super-comfort rather than greatest speed. Her first keel-plate was laid in Harland & Wolff's yard at Belfast on December 16, 1908, and she was launched on October 20, 1910. She was a triple-screw vessel of 46,439 gross tons and 21,900 net tons, built for service between Southampton and New York. With a length between perpendiculars of 852½ feet, and a beam of 92½ feet, she was the largest vessel in the world.

From keel to navigating bridge she rose to a sheer height of 104 ft. A system of fifteen transverse watertight bulkheads, dividing the ship into sixteen separate compartments, had been devised by Lord Pirrie and his naval architects, and these were generally contended to offer an invincible protection against the danger of the heaviest North Atlantic weather. The official description of the vessel circulated by the owners, stated that : "Each watertight bulkhead door is held in the open position by a suitable friction clutch, which can be instantly released by means of a powerful electric magnet controlled from the captain's bridge, so that, in the event of an accident, or at any time when it might be considered advisable, the captain can, by simply moving an electric switch, instantly close the doors throughout—practically making the vessel unsinkable."

The propelling machinery consisted of two sets of four-cylinder reciprocating steam engines, each driving a wing propeller, and a low-pressure turbine driving the centre propeller. The designed horse-power was 50,000, but it was recognised that she would probably develop at least 55,000.

The managers of the line had transferred the terminus of their mail service from Liverpool to Southampton in 1907 as experience had shown them that Paris was as much the objective of the American traveller as London.

The *Adriatic* inaugurated the new service between Southampton, Cherbourg, Queenstown, and New York, the homeward route being via Plymouth and Cherbourg, by which means opportunity was provided for travellers to disembark at either an English or French channel port. The service was successful from the start, sailings at first being maintained by the *Adriatic*, *Oceanic*, *Majestic* and *Teutonic*.

The Mersey port was not abandoned and weekly sailings were made from Liverpool to New York via Queenstown with twin-screw passenger steamers such as the *Baltic*, *Cedric*, *Celtic* and *Arabic*. This, however, was not the express mail service, and Liverpool now disappears from our story.

The *Olympic* was the first new tonnage to be built for the Southampton run. Considering the great interest which had been taken in her during her construction, it was remarkable that at the

launch, when the largest and heaviest vessel to be put into the water left the ways, there was practically no external display of enthusiasm. Harland & Wolff's yard was much as usual, and there was an absence of ceremonial, giving the impression to the onlooker that the event was one of everyday occurrence.

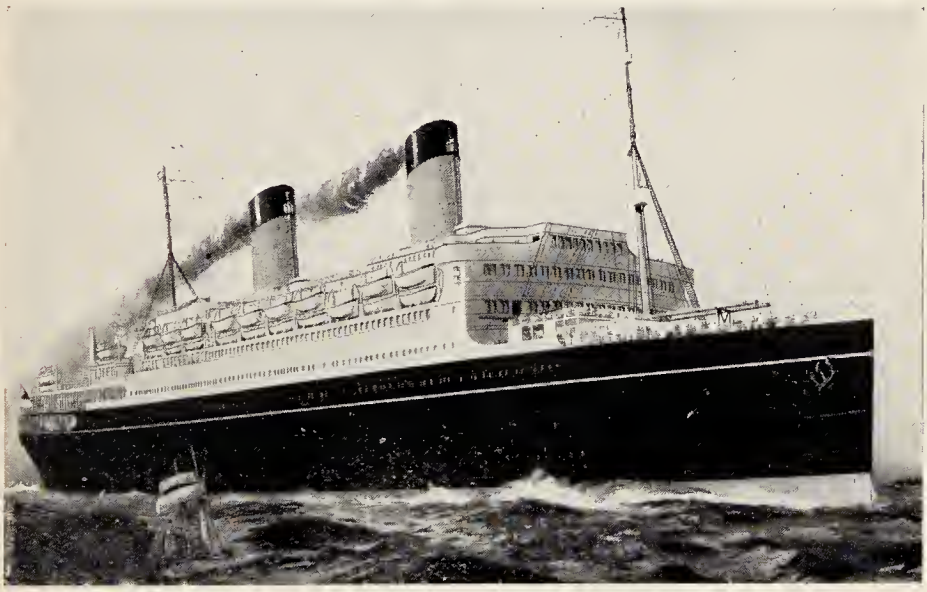
The work of completion was carried out rapidly and took only seven months, a performance highly creditable to all concerned, bearing in mind the dimensions of the vessel. She left the builders' yard on May 31, 1911, for the English Channel preparatory to taking her place on the station, after an informal trial trip which was entirely gratifying to her owners.

When the *Olympic* left Southampton on Wednesday, June 14, 1911, on her maiden voyage to New York, an enormous crowd gathered on the pier to watch the great ship leave her moorings, and she was given an ovation seldom previously accorded in the annals of shipping.

On her maiden voyage the *Olympic* did well, averaging 21·17 knots on the westward and 22·32 knots on the homeward run, which was a somewhat better speed than was generally expected.

THE WHITE STAR LINER "MAJESTIC"

Launched before the War as *Bismarck*, from the Blohm & Voss yard, Hamburg, she is the largest liner in the World.



THE WHITE STAR LINER "HOMERIC"

This vessel was also of German origin, having formerly been the *Columbus*, of the pre-war Norddeutscher Lloyd Fleet.

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THE WHITE STAR LINER "ADRIATIC"

She inaugurated the new service from Southampton to New York when the White Star Line transferred the terminus of their mail service from the Mersey to the English Channel in 1907.

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The outward journey was uneventful, but a novel incident characterised the departure from New York. One of the passengers, W. Atlee Burpee, having left without his spectacles, sent a radio request to the Wanamaker Stores to send them on to his London address. The Stores saw a chance to make a demonstration of their service, and accordingly secured the assistance of T. O. M. Sopwith to deliver the glasses by aeroplane to the deck of the *Olympic* before she got clear of American waters. Sopwith duly caught up the vessel and dropped the packet, as he thought, on board, but as it was never found he must have failed to reach his objective. Apart from the disappointment over what was in itself a trivial matter, the incident was used in America as an argument of the unreliability of aircraft for the bombing of vessels in war, as it was contended that if an experienced aviator like Sopwith, with everything in his favour, failed to hit such a mark as the *Olympic's* deck, the largest in the world, it was unlikely that a hostile missile could be directed on a warship using every effort to escape and also trying to bring down the attacking machine.

The policy of the White Star Line, as exempli-

fied in the *Olympic*, proved sufficiently satisfactory to the owners and was so much appreciated by the travelling public that Harland & Wolff were commissioned to build similar vessels, but of somewhat greater tonnage. One of these was under construction at Belfast and had actually been launched when the War broke out. She was named *Britannic*, to commemorate the famous ship of 1874 which had so worthily conducted herself as a record breaker in the period of intense competition some four decades earlier.

The new vessel was hastily completed in 1915 and commissioned as a hospital ship, in which capacity she performed meritorious work. Her career was soon cut short, however, and she was lost in the Ægean Sea off Greece on November 21, 1916, through striking a mine. The largest vessel ever to be built in a British yard was thus never permitted to make a single voyage across the Atlantic.

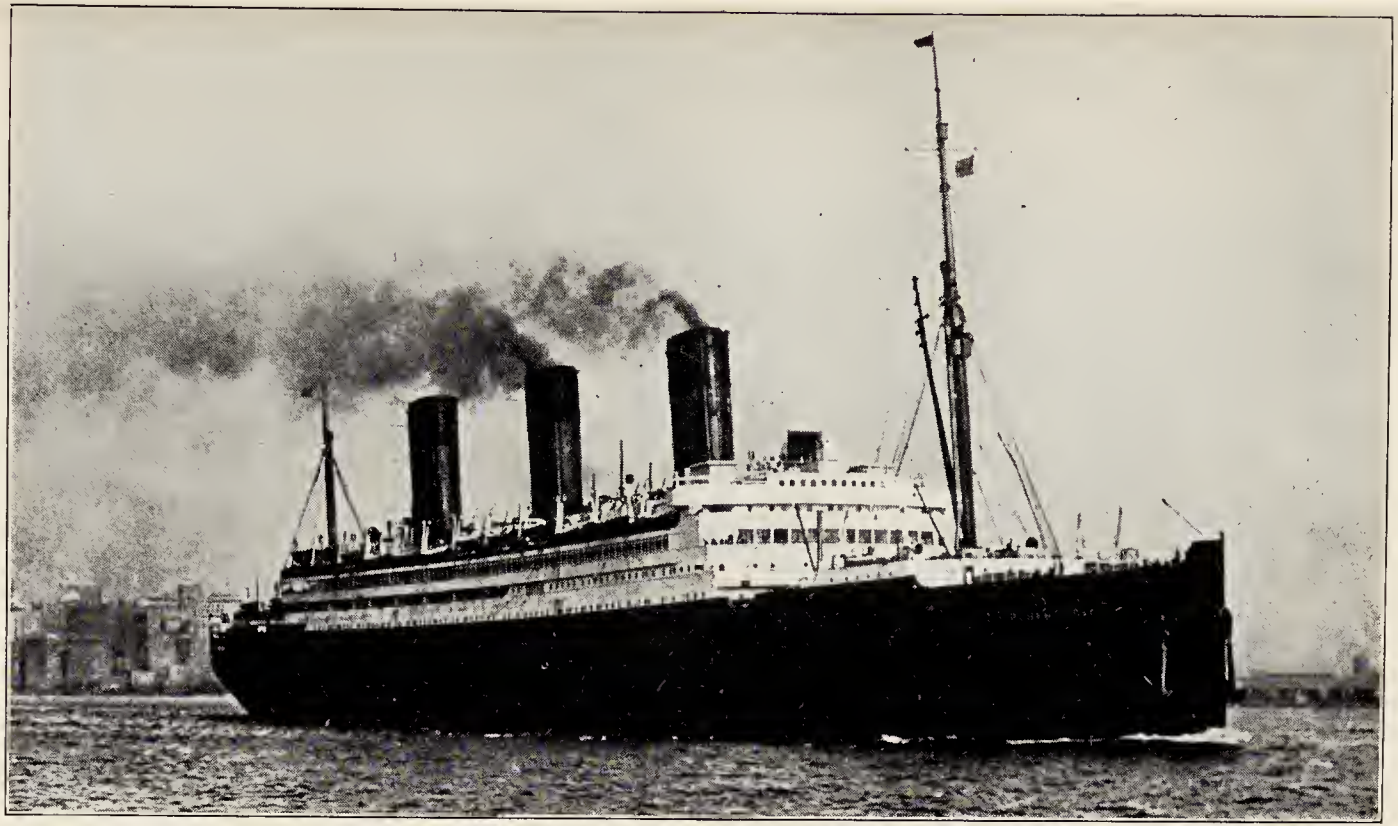
Quite recently the name *Britannic* has again appeared in the White Star fleet in the form of a new motorship which was ordered in April, 1928, launched at Belfast on August 6, 1929, and sailed from Liverpool on her maiden voyage on June 28, 1930. With a length overall of

712 feet, a gross tonnage of 26,943, and a service speed of 16 knots, she has pre-eminence in neither speed nor size as had her patronymics. She is introduced into our story by reason of her propelling machinery—heavy-oil internal-combustion engines—a class of propulsive agent which may in future drive a Blue Riband holder. Such engines are relatively new to the sea; the first ocean-going motorship was the *Selandia* of 1912, and the first passenger motor liner the *Aorangi*, completed in 1924 by the Fairfield Shipbuilding and Engineering Company, Ltd., for the Union Steam Ship Company of New Zealand, Ltd.

The *Britannic* has quite a number of "record" features, although not of the size or speed categories. She is the largest British motorship, the largest vessel working between Liverpool and New York, and the first unit of the White Star fleet to be built under Lloyd's special survey. Her two Harland & Wolff-Burmeister & Wain four-stroke cycle double-acting engines have a combined power of about 26,000 I.H.P., so that the ship is second only in power, as also in size, to the largest motorship in the world, the *Augustus* of Navigazione Generale Italiana.

The *Britannic* will be easily recognisable on the North Atlantic run as she has the characteristic low oval funnels of her builders' design first introduced in the R.M.S.P. *Asturias* in 1925. Even with steamships it has long been customary to fit funnels in excess of requirements on first-class liners to satisfy the æsthetic taste of passengers, and on motorships the needs for funnels is lessened, as there is no main boiler smoke, and only the motor exhaust. On the *Britannic* a novel use has been found for the forward funnel as approximately half of it constitutes a smoking room for the engineers.

After the War, the place of the lost *Britannic* was filled by the *Majestic*, whose German origin and early history will be mentioned subsequently. She made her initial voyage in the White Star service in May, 1922, and has proved a most consistent performer. With a service speed of 24½ knots she amply fulfils the requirements of her British owners, and has shown herself capable of some smart passages. Among these was one in December, 1922, from New York to Cherbourg in 5 days 6 hours 13 minutes, which was further improved upon by a fine crossing in September,



THE CUNARDER "BERENGARIA"

Built in 1912, was originally the *Imperator*, constructed at Hamburg by the Vulcan Werke for the Hamburg-Amerika Line.

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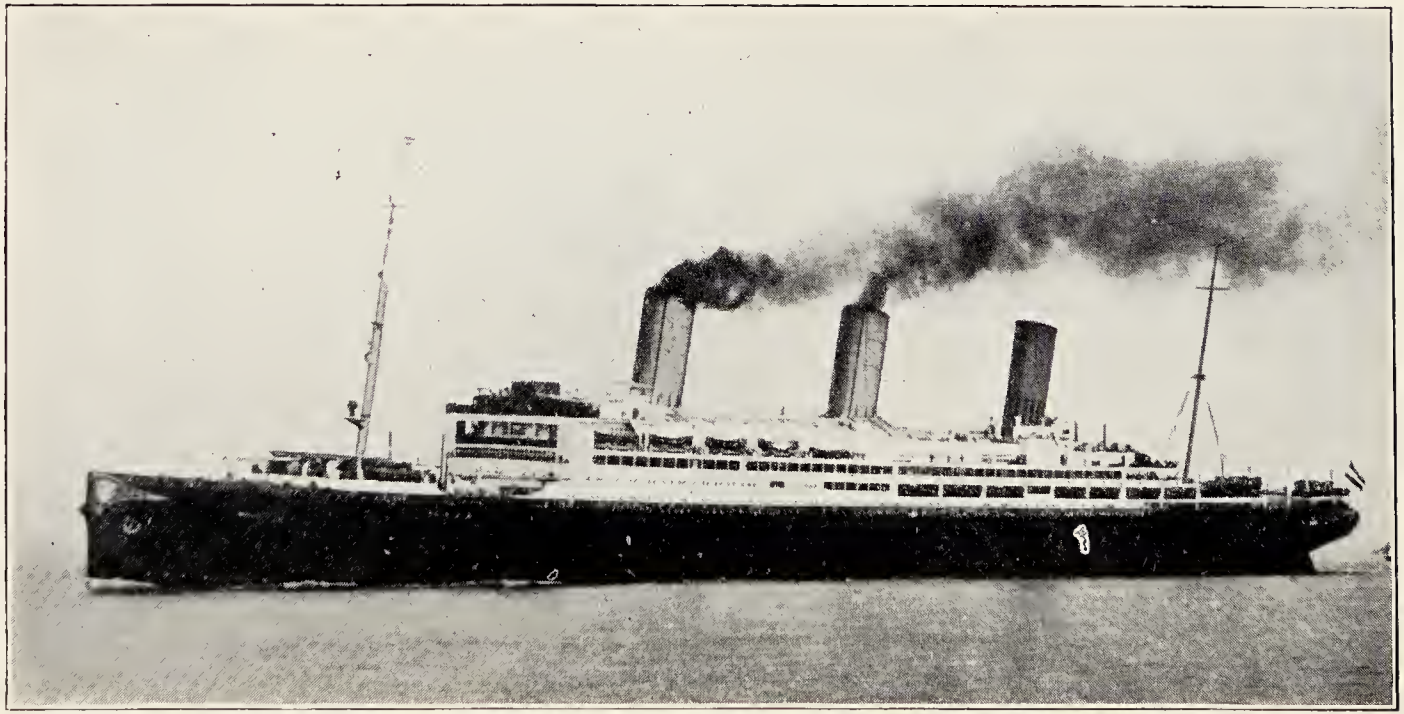

THE AMERICAN-OWNED "LEVIATHAN"

One of the two largest ships in the World. She was built by Blohm & Voss, of Hamburg, in 1914, and was originally named *Vaterland* by her German owners.

1923, in 5 days 5 hours 21 minutes between the same points.

In the *Majestic* the White Star Line still have the honour which they desire of owning the largest steamer in the world. As the *Majestic's* gross tonnage is only 56,620 against the 59,956 of the American-owned *Leviathan*, a word of explanation is necessary. Gross tonnage is a measure of the total cubic volume of the enclosed part of a ship (that is, not including open decks), and is given in measurement tons on the basis of 100 cubic feet per ton gross. Tonnage is volume, and is not connected with displacement, which is the total weight of the vessel. The system of measuring gross tonnage adopted by the United States Shipping Board is different from the British rules; hence the anomalous position that the *Leviathan*, which is the slightly smaller vessel—she is 8 feet shorter than the *Majestic*—has a larger gross tonnage. The *Majestic* measured on the American system would be 61,206 tons against the *Leviathan's* 59,956. Alternatively, under British rules the *Leviathan* would have 54,282 tons to the *Majestic's* 56,620.

CHAPTER XVII

WHEN THE WAR CAME

The great kudos of holding the Blue Riband, to say nothing of the very definite commercial value associated with it among the "super first-class" travellers, was naturally not overlooked by the enterprising German shipping concerns, and while the White Star Line was attracting the interest of the whole world with the *Olympic*, Germany was making careful and determined preparations to bring speed honours to their own shores. This effort took the form of building a triumvirate of huge ships which doubtless would have made a great bid for the cream of the North Atlantic traffic but for the intervention of the War. The first of these was the 52,000-ton *Imperator*; her keel was laid at the Vulcan yard, Hamburg, in August, 1910, and she was launched on May 23, 1912, the naming ceremony

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THE FAMOUS "KRONPRINZESSIN CECILIE"

Built by the Vulcan Yard at Stettin in 1906, and placed on service by the Norddeutscher Lloyd in August, 1907.

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THE "AQUITANIA"

Built at Clydebank in 1914, by John Brown & Co., Ltd., is one of the most popular ships on the North Atlantic.

being performed by the then-German Emperor, such was the event deemed to be of great national significance. She left on her maiden voyage at the end of May, 1913. Her principal dimensions, etc. are given in one of the tables in the Appendix under her post-war name of *Berengaria*.

The second ship, the *Vaterland*, was laid down in September, 1911, in the Blohm & Voss yard. At her launch on April 3, 1913, she was named by Prince Rupprecht of Bavaria. The *Vaterland* went into service in the middle of May, 1914, and therefore barely saw service under her German owners' flag before the commencement of hostilities. She is, of course, now the largest vessel of the American mercantile marine, in whose Atlantic service she bears the name *Leviathan*.

The third of the group was the *Bismarck*, which, although launched before the War, as is well known, was not finished until after the conclusion of hostilities, and then, with the *Columbus*, passed into the hands of the White Star Line, in whose service they were re-named, the *Bismarck* being to-day the *Majestic*, and the *Columbus* the *Homeric*. The present *Columbus*

of the Norddeutscher Lloyd fleet is entirely a post-war vessel, but is almost identical with the other.

Another important addition to the Atlantic fleet was the vessel for which, in the last month of 1910, the Cunard Line placed the order with John Brown & Co., Ltd., of Clydebank, the keel being laid in June, 1911.

The vessel, which was named *Aquitania*, is the largest liner yet built in Great Britain, although, in advancing this claim, it is only fair to the White Star Line to acknowledge that their *Olympic* of 46,439 gross tons, built at Belfast by Harland & Wolff, Ltd., is even larger, and has the honour of being the biggest vessel launched in the United Kingdom.

The Cunard Line was already safely possessed of the Blue Riband, and therefore they had no object, when planning the *Aquitania*, to design a record breaker. A speed of about 23 knots was considered sufficient, although in favourable weather conditions she has exceeded this by about a knot. The main object was to produce a "comfort" ship of large capacity, and in this her owners amply succeeded, the *Aquitania* being,

in fact, one of the most popular ships afloat on the North Atlantic.

Although this liner made her maiden voyage in May, 1914, the War was to intervene before she had any real opportunity of earning her present proud position with the travelling public. She had made only three trips from Liverpool to New York before the British Government took her over at the outbreak of War. After she had been converted, remarkably rapidly, into an armed cruiser carrying 6-in. guns, she left the Mersey on August 8, 1914, for patrol duty. In May, 1915, the *Aquitania* was again converted, this time into a transport, and by August of the same year had conveyed some 30,000 troops to the Dardanelles. She then became a hospital ship until the end of 1916, during which period she carried approximately 25,000 wounded men. Again requisitioned, early in 1918, as a transport, she played a prominent part in bringing American soldiers across to Europe; in this service she made nine trips across the Atlantic. In fact, the *Aquitania's* war service included the conveyance of upwards of 120,000 troops in her varying capacities, and immediately after the War, she

carried tens of thousands of Canadian and American soldiers back to their own side of the Atlantic.

At first sight it may appear to be a departure from our subject of "The Blue Riband" to make mention of the introduction and progress of radio communication, but when it is considered what an important part it plays in the operation of high-speed services in the notification of the location of ice, summoning assistance in the event of disaster, and in a hundred other ways, it would be an omission not to refer to the great invention which has so materially assisted in making the present-day phenomenal Atlantic speeds possible.

Wireless communication between ships at sea and the land has become such a routine matter that it is difficult to realise how short a time it has been with us. For practical purposes, its birth dates from 1896; two years later connection was established for the Corporation of Lloyd's between Ballycastle and the Rathlin Island Lighthouse, off the north coast of Ireland, a distance of but $7\frac{1}{2}$ miles, and in the same year Marconi installed apparatus on board the royal

THE NORDDEUTSCHER LLOYD LINER, "GEORGE WASHINGTON"
Which was placed on the North American Service in June, 1909.

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THE NORDDEUTSCHER LLOYD PIERS AT HOBOKEN, U.S.A.

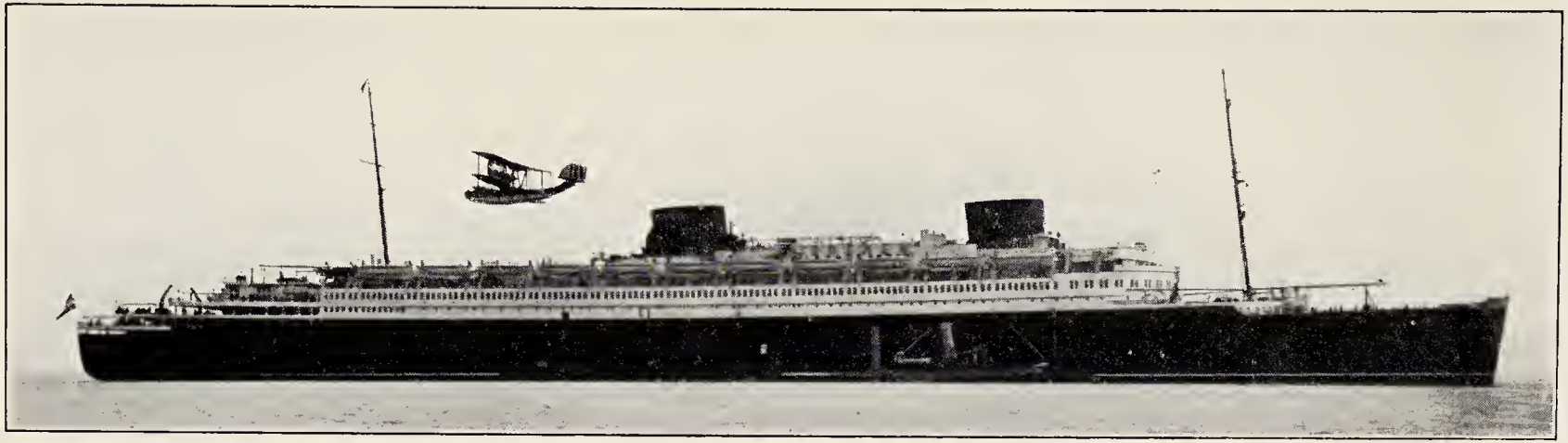
Before the War these were owned by the North German Lloyd Dock Company, and were confiscated by the American Authorities during the War.

yacht, *Osborne*, in Cowes Bay, by which Queen Victoria communicated with the then Prince of Wales. In January, 1901, messages were sent from St. Catherine's, Isle of Wight, a distance of 106 miles to the Lizard, Cornwall. This success encouraged Marconi to attempt the more difficult task of sending wireless signals across the Atlantic, which was accomplished for the first time on December 11, 1901, when signals were transmitted from Poldhu Station, in Cornwall, and picked up 1,800 miles away at St. John's, Newfoundland. Conducting a successful experiment, however, had not brought transatlantic radio communication within the range of commercial operation, and some years were to elapse before ordinary service was available to vessels on the North Atlantic.

An interesting incident of the early days took place in May, 1902, when the Cunarder, *Umbria*, was *en route* from New York to Liverpool with the American Ambassador. Speaking at a concert during the voyage he expressed the hope that on landing, they might learn of the termination of the South African War. Late that night, a wireless message was picked up by the ship

with the welcome tidings that peace had been signed.

Any comprehensive survey of radio communication is really outside our scope in telling the story of the Blue Riband, but no mention of the North Atlantic would be complete without reference being made to the first use of wireless in effecting the capture of a criminal on the high seas. When Dr. Crippen murdered his wife, Belle Elmore, in 1910, and sailed for Montreal on the *Montrose* under an assumed name, it is doubtful who experienced the greatest surprise, whether Crippen, his lady companion in flight, Ethel Le Neve, or the general public, when the pair were arrested by the Canadian authorities following identification by the Captain of the *Montrose*, and the necessary notifications by wireless.



The Norddeutscher Lloyd's famous quadruple-screw Atlantic Flyer *Bremen*, with which Germany captured the Blue Riband in July, 1929.

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The Norddeutscher Lloyd quadruple-screw steamship *Europa*, built by Blohm & Voss, at Hamburg. After a series of misfortunes during her construction she made a triumphant maiden passage in March, 1930, at an

CHAPTER XVIII

GERMANY'S POST-WAR SUCCESS

At the conclusion of the War, Germany found herself virtually without an ocean-going fleet, and the three huge vessels, *Imperator*, *Vaterland* and *Bismarck*, with which the Norddeutscher Lloyd was making a great bid for the cream of the North Atlantic traffic, were all sailing under other flags. The *Bismarck*, although launched before the War, was not finished until afterwards, and then with the *Columbus*, passed into the hands of the White Star Line, the *Bismarck* becoming the *Majestic*, and the *Columbus* the *Homeric*.

It was not until the latter part of 1926, that the Norddeutscher Lloyd was sufficiently far forward with its programme of rehabilitation to be able to entertain the building of new entrants for Atlantic honours. In December, 1926, the

two new ships, *Bremen* and *Europa*, were ordered, the former from the Weser A.-G. shipyard at Bremen, which shortly afterwards became a part of the new combine, Deutsche Schiff-und Maschinenbau A.-G. (Deschimag), and the latter from the Blohm & Voss shipyard at Hamburg. The keel of the *Bremen* was laid on June 18 and that of the *Europa* on July 23, 1927. Building progress was very rapid for such huge ships and, barring an accident, both vessels would have been ready to take their stations in the spring of 1929.

The launching ceremonies were performed on consecutive days of August, 1928, and enormous crowds gathered from practically every part of the world. The Hamburg festivities took place on August 15, the whole shipping quarter of the city closing down for the half day, although the ceremony was not due to start until five o'clock. On the Elbe it seemed as if all the small craft had been chartered to ferry the sight-seers across to the yard. Tugs, launches, motor boats of all sizes, and a hundred and one other types of craft all surged towards the landing-stages, those of the outside pressing so hard that

the loaded vessels found it almost impossible to get out again into the river. Long before the actual launch took place, more than 100,000 people were assembled, and special accommodation was provided for upwards of 200 newspaper representatives from every part of the civilised world.

Dr. Schurman, the American Ambassador in Berlin, delivered an address, which was transmitted by loud speaker to all parts of the shipyard, and then Miss Ines Glassel named the vessel *Europa*. The ship began to move, barely perceptibly at first, and then gathering momentum, until she glided majestically and steadily into the water. Thus was born one of Germany's two great efforts to win back her former proud position on the North Atlantic.

It was natural that there should have been reserved for the next day, at Bremen, even greater events than had occurred at Hamburg. The second ship bore the name of the city where, more than seventy years previously, the Norddeutscher Lloyd had been founded; the name also which had been carried by the pioneer Atlantic

vessel of this fleet, when she set out on her maiden voyage on June 19, 1858.

As at Hamburg, business houses were closed for the half-day and an enormous crowd foregathered at the Weser shipyard. Enthusiasm was undoubtedly greater than at Hamburg, stimulated very largely by the President of the Republic, who on his arrival, received a tremendous ovation. Dr. Schurman, as a diplomat, had naturally been guarded in his observations, but when President von Hindenburg rose to perform the launching ceremony, he was a leader addressing his own people with a national pride which could be well understood.

The *Bremen* was the first of the pair to be completed, and when she commenced her maiden voyage on July 16, 1929, the phase of comparative tranquillity which had characterised international competition in the transatlantic service for the fifteen years which had intervened since the outbreak of the war was somewhat rudely, if not altogether unexpectedly, broken. On her maiden voyage the *Bremen* made the Atlantic crossing from Cherbourg to Ambrose Light at the entrance to New York Harbour in 4 days

17 hours 42 minutes, thus exceeding the fastest crossing of the Cunarder *Mauretania* (4 days 21 hours 44 minutes) which had been made in August, 1928.

On the return eastbound run the previous record, also held by the *Mauretania*, was similarly captured by the *Bremen*. Westward the *Bremen* maintained an average speed of 27·83 knots, and on her homeward run from Ambrose to Eddystone she averaged 27·91 knots over the 3,000 odd miles.

These are arresting figures, and that such times should have been set up on the initial voyage of a ship which is fitted with by far the most powerful machinery installation thus far built into any mercantile vessel, suggested not only that the *Bremen* must have a substantial reserve of power and speed in hand, but indicated a high degree of confidence and competence on the part of her engineers.

It was the privilege of *The Marine Engineer* to publish exclusively the following details of the maiden voyage performance, which I am permitted to reproduce here. It will be noticed that on the outward run to New York a speed of

27·83 knots was averaged in weather which was certainly not conducive to the vessel giving of her best, while on the return passage the average speed was improved to 27·91 knots, the weather again being not too favourable.

Maiden Voyage—Bremerhaven—New York.

Departure from Bremerhaven, July 16, 6.18 min. (M.E.T.).
Distance, 454 miles.

Departure from Southampton, July 17, 8 p.m. (M.E.T.);
Distance, 82 miles.

Departure from Cherbourg, July 18, 2.12 a.m. (M.E.T.).

July	Lat., North.	Long. West.	Daily Mileage	Wind.	Remarks (Weather, &c.).
	° ′	° ′			
18	49 49	8 59	288	S.W. 4-6 .	Cloudy, rather rough sea, patches of fog, reduced speed.
19	48 01	26 09	687	W.S.W. 5-3 6-7	Overcast, passing showers, rather rough sea.
20	43 30	41 37	704	N.N.W. 5-3	Fine and clear, moderate sea.
21	40 59	56 42	705	N.W. 2-4 .	Generally fair, slight sea, patches of fog, reduced speed.
22	40 30	72 22	713	N.E. 2-3 .	Overcast, slight sea, 1 p.m. mail-plane started, reduced speed.
		Rest	67		

Total distance, 3,164 miles; total time, 4 days 17 hours 42 min.; average speed 27·83 knots.

Maiden Voyage—New York—Bremerhaven.

July	Lat., North.	Long., West.	Daily Mileage	Wind.	Remarks (Weather, &c.).
	° ′	° ′			
27	40 13	68 28	249	S.W.-S.E. 2-3	2.42 a.m. (D.S.T.) passed Ambrose Channel Light vessel.
28	40 40	54 40	629	S.E. 2-5 .	Generally fair, slight sea.
29	43 17	41 11	641	W. 2-3 .	Fine weather, slight sea.
30	47 29	26 57	651	W.S.W. 4-7	Mostly overcast, rather rough to rough sea.
31	49 34	10 30	667	W. 7-8 .	Cloudy, rough sea and W. swell, 9.12 p.m. G.M.T passed Eddystone Lighthouse.
		Rest	247		

Total distance, 3,084 miles; total time, 4 days 14 hours 30 min.; average speed, 27·91 knots.

THE NORDDEUTSCHER LLOYD LINER "COLUMBUS" OF 1923

Which replaced and was almost identical with the pre-war *Columbus* which passed into the hands of the White Star Line as the *Homeric*.

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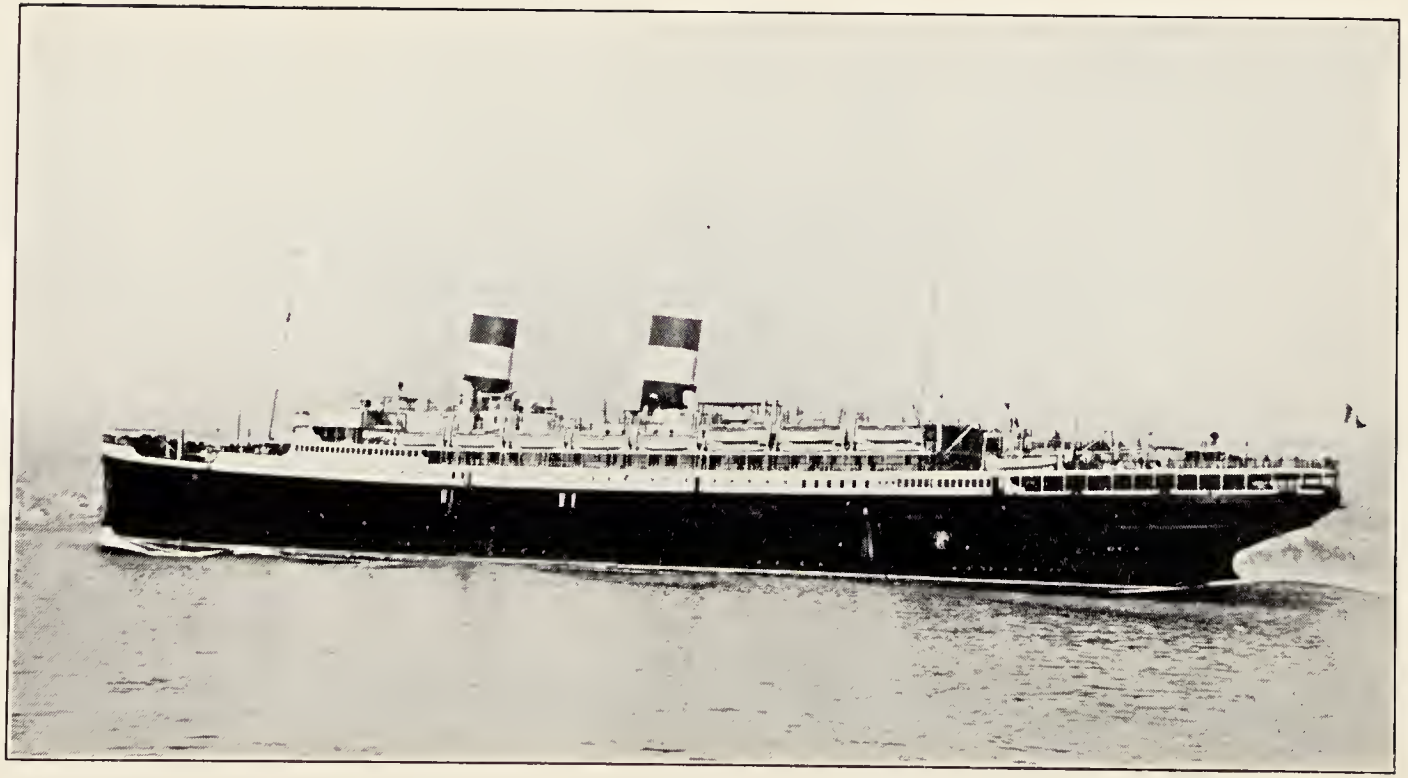

The largest motorship afloat. The *Augustus*, owned by the Navigazione Generale Italiana of Genoa. A vessel of 32,650 gross tons, built at the Ansaldo Yard, Sestri Ponente, and placed on her owner's North American Service in 1927.

The *Bremen*, which was designed by Herr Hermann Hein, is subdivided by means of fourteen watertight bulkheads, and it is claimed that if two adjoining compartments are open to the sea the vessel would still remain afloat. Furthermore, it is also claimed that if three compartments at the stern, or the first four compartments forward are completely flooded, neither the safety nor the propulsion of the vessel is seriously prejudiced. A feature of the vessel is the provision of very large unsinkable motor-propelled lifeboats, each boat holding about 145 persons. The lifeboats are so arranged that should the motor compartment be submerged the engine will still continue to operate.

Accommodation is provided as follows:

First class	800
Second class	300
Interchangeable first or second class	200
Tourist class	300
Third class	600
Crew	1,050
Total complement	3,250

A feature of the deck equipment is the 89-ft. Heinkel aeroplane launching gear, situated between the funnels.

The most interesting feature of the vessel is undoubtedly her propelling machinery, in view of the fact that the power with which she is provided is greatly in excess of that in any other mercantile vessel excepting her sister *Europa*. In fact, the maximum power provided is about double that of the Cunarder *Mauretania* in her original form.

Having seen something of the early achievement of the *Bremen*, it is interesting to consider a few of the details of her dimensions and machinery. The owners have not yet entirely removed the ban of secrecy regarding various details, but the main particulars were officially made known after her triumphant and record-breaking runs. She is a quadruple-screw vessel with the following principal particulars:

Length overall . .	938 ft. 3 ins.
Breadth . . .	102 ft.
Depth to main deck .	54 ft.
Gross tonnage . .	51,656 tons
Load displacement, about	52,000 tons
Corresponding draught .	31 ft. 9 ins.
Block coefficient, about .	0·60
Service speed, about .	28 knots
Trial speed, about . .	28½–29 knots
Corresponding power, about	130,000–140,000 S.H.P.

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THE "STATENDAM"

Claimed to be the most economical steamship in the world, was added in 1929 to the fleet of the Holland-America Line. Built and engined by Harland & Wolff, Ltd., Belfast, she was fitted out by Wilton's, of Rotterdam. Her fastest passage was in June, 1930, when she made the voyage from New York (Ambrose Channel) to Plymouth, in 6 days and 12 hours, a record for the Holland-America Line vessels.

Britain's Largest Motorship—The White Star Liner "Britannic"

Built and engined by Harland & Wolff, Ltd., Belfast, for her owner's Liverpool—New York Service. As her speed is only about 17 knots, she is, of course, not intended for high-speed work.

For the design of the machinery Dr. Gustav Bauer has been primarily responsible, and the Deschimag were singularly fortunate in being able to avail themselves of the services of this brilliant and widely-experienced marine engineer, who, prior to the creation of the Deschimag, was the technical head of the Vulcan Werke, Hamburg. Dr. Bauer's reputation extends beyond the borders of Germany, and as the designer of machinery for several of the famous pre-war German contenders for the Blue Riband, as well as the machinery of the largest battle-cruisers and of the Hapag *Imperator*, now *Berengaria*, his experience may be said to be almost unique. He has also been fortunate in being able to enjoy the assistance and collaboration, under the Deschimag, of the large number of experienced technical experts drawn from the staffs of the Stettiner Vulcan yard and the Vulcan Werke as well as those already engaged at the Weser A.-G.

The *Bremen* is propelled by four solid type four-bladed bronze propellers. It is worthy of note that the contract for the propellers was shared by two British and one German firm, J. Stone & Company Limited and the Manganese

Bronze Company each supplying one working propeller for the *Bremen* and one for the *Europa*. Each propeller is driven by a set of single-reduction geared turbines of the reaction type, these also having been manufactured and installed by the Deutsche Schiff-und Maschinenbau A.-G. Each set of turbines consists of high, intermediate and low-pressure ahead units with independent astern turbines. The turbines run at 1,800 r.p.m., this being reduced to a propeller-shaft speed of 180 r.p.m.

Steam is supplied to the turbines by twenty oil-fired water-tube boilers. These boilers are of modified Thornycroft type, eleven being double-ended and nine of the single-ended type. The boilers are arranged in two widely separated boiler-rooms, which arrangement explains the somewhat wide pitching of the funnels. Incidentally, the main machinery space is also divided into separate compartments, the auxiliary machinery being placed aft of the main engine-room. The working steam pressure is 330 lb. per sq. in., while the steam is superheated to a temperature of 700° F. in superheaters which are integral with the boilers. The boilers are oil-

fired on the builders' system, and the closed stoke-hold system of forced draught is used.

The *Europa* was badly delayed by a fire on board while she was fitting out alongside Blohm & Voss's yard, and was therefore not ready to take up her place on the station until March, 1930. She is about 936 ft. long, with an overall beam of 101 ft.

Accommodation is provided for four classes of passengers, viz., first, second, tourist-third and third-class, divided up as follows:—first-class, 800; second-class, 500; tourist-third, 300 (which can be increased by 500 by making use of parts of the second-class accommodation) and third-class, 600. The total number of crew, including officers, is approximately 975.

Like the *Bremen*, the *Europa* is propelled by high-pressure steam turbines and the electric generators by diesel engines. The boiler plant is split up into two main groups very widely apart. This may also be inferred from the wide spacing of the two funnels. The sub-division is carried out in such a manner that in the case of a severe collision one of the main boiler groups will always be intact. There are four single-

reduction geared turbines of the reaction type acting on four shafts. The four independent turbines and gears are accommodated in two separate main engine rooms with a watertight bulkhead between.

As was the case nearly a quarter of a century earlier with the Cunarders, the *Europa* was generally expected to represent her builders in the friendly rivalry between the two German shipyards by attempting to beat the *Bremen's* best performance, and this she duly did on her maiden voyage by making the crossing from Cherbourg to the Ambrose Lightship in 4 days 17 hours 6 minutes at an average speed of 27·9 knots.

There the Blue Riband for the moment remains. The position which has now been created has given a tremendous stimulus to international rivalry, and in the midst of the several schemes projected in Great Britain, America, France and Italy for the building of giant express liners, the only reasonably certain fact which would appear to emerge for the future is that the *Europa* is unlikely to retain her present proud record for very long. The honours have been held by

Great Britain for the greater part of the past century, latterly by the *Mauretania* for a much longer period than has any other vessel. Apart from the economic hazards which attach to the possession of the Blue Riband, there is no more coveted distinction in the annals of shipping. The task of Germany's challengers is formidable, but the country which has built such ships as the *Mauretania*, and has given birth to such men as James Watt, Charles Parsons and Andrew Laing, will, we may be fully assured, take up the challenge with the highest confidence and courage, and will not fail.

APPENDIX

RECORD ATLANTIC PASSAGES, 1840–1930.
DETAILS OF LARGEST LINERS

Record Atlantic Passages, 1840–1930.

Year	Month	NAME OF STEAMER	Gross Tons.	OWNERS	VOYAGE From	VOYAGE To	Distance N. Miles	Passage D.	Passage H.	Passage M.	Approx. Speed
1840	July	*Britannia*	1,154	Cunard Line	Liverpool	Halifax, N.S.	2,534	12	10	0	8.50
1840	Aug.	*Acadia*	1,154	Cunard Line	Liverpool	Halifax, N.S.	2,534	11	4	0	9.45
1840	Aug.	*Britannia*	1,154	Cunard Line	Halifax, N.S.	Liverpool	2,534	10	0	0	10.56
1841	July	*Acadia*	1,154	Cunard Line	Liverpool	Halifax, N.S.	2,534	10	22	0	9.67
1841	July	*Acadia*	1,154	Cunard Line	Halifax, N.S.	Liverpool	2,534	9	21	0	10.76
1842	Sept.	*Acadia*	1,154	Cunard Line	Halifax, N.S.	Liverpool	2,534	9	15	0	10.97
1847	July	*Hibernia*	1,422	Cunard Line	Halifax, N.S.	Liverpool	2,534	9	1	30	11.67
1850	May	*Asia*	2,226	Cunard Line	Liverpool	Halifax, N.S.	2,534	8	17	0	12.12
1851	May	*Pacific*	2,860	Collins Line	New York	Liverpool	3,078	9	20	26	13.01
1851		*Baltic*	2,860	Collins Line	Liverpool	New York	3,017	9	13	0	13.17
1852	Feb.	*Atlantic*	2,860	Collins Line	New York	Queenstown	2,712	9	17	15	11.61
1856	June	*Persia*	3,300	Cunard Line	Queenstown	New York	3,070	9	21	41	12. 9
1856	June	*Persia*	3,300	Cunard Line	New York	Queenstown	2,732	9	1	45	12.53
1862	June	*Scotia*	3,871	Cunard Line	New York	Queenstown	2,700	8	22	0	14.06
1863	Dec.	*Scotia*	3,871	Cunard Line	New York	Queenstown	2,731	8	3	0	14. 0
1864	June	*Scotia*	3,871	Cunard Line	Queenstown	New York	2,851	8	4	34	14.54

RECORD ATLANTIC PASSAGES 1840–1930—*Contd.*

Year	Month	NAME OF STEAMER	Gross Tons.	OWNERS	VOYAGE From	VOYAGE To	Distance N. Miles	Passage D.	Passage H.	Passage M.	Approx. Speed
1867	Nov.	*Russia* . . .	2,960	Cunard Line	New York	Queenstown	2,731	8	0	28	14.22
1867	Nov.	*City of Paris* (*No.* 1) .	2,556	Inman Line	Queenstown	New York	2,700	8	4	1	13.77
1869	Dec.	*City of Brussels* . .	3,747	Inman Line	New York	Queenstown	2,786	7	22	3	14.66
1872	May	*Adriatic* (*No.* 1) . .	3,888	White Star L.	Queenstown	New York	2,778	7	23	17	14.41
1873	Jan.	*Baltic* (*No.* 1) . .	3,707	White Star L.	New York	Queenstown	2,843	7	20	9	15.12
1875	Sept.	*City of Berlin* . .	5,491	Inman Line	Queenstown	New York	2,829	7	18	2	15.21
1875	Oct.	*City of Berlin.* . .	5,491	Inman Line	New York	Queenstown	2,820	7	15	28	15.41
1876	Feb.	*Germanic* . . .	5,008	White Star L.	New York	Queenstown	2,894	7	15	17	15.81
1876	Nov.	*Britannic* . . .	5,004	White Star L.	Queenstown	New York	2,795	7	13	11	15.44
1876	Dec.	*Britannic* . . .	5,004	White Star L.	New York	Queenstown	2,882	7	12	41	15.97
1877	April	*Germanic* . . .	5,008	White Star L.	Queenstown	New York	2,830	7	11	37	15.76
1877	Aug.	*Britannic* . . .	5,004	White Star L.	Queenstown	New York	2,802	7	10	53	15.72
1879	July	*Arizona* . . .	5,147	Guion Line	Queenstown	New York	2,800	7	10	22	15.73
1879	July	*Arizona* . . .	5,147	Guion Line	New York	Queenstown	2,810	7	8	11	15.96
1882	April	*Alaska* . . .	6,400	Guion Line	Queenstown	New York	2,803	7	6	43	16.10
1882	June	*Alaska* . . .	6,400	Guion Line	New York	Queenstown	2,791	6	22	0	16.80

Year	Month	NAME OF STEAMER	Gross Tons.	OWNERS	VOYAGE From	To	Distance N. Miles	Passage D.	H.	M.	Approx. Speed
1882	Sept.	*Alaska* . . .	6,400	Guion Line	New York	Queenstown	2,800	6	18	38	17.17
1884	April	*Oregon* . . .	7,375	Guion Line	New York	Queenstown	2,815	6	16	57	17.48
1884	June	*America* . . .	5,530	National L.	New York	Queenstown	2,815	6	14	8	17.71
1884	Aug.	*Oregon* . . .	7,375	Cunard Line	Queenstown	Sandy Hook	2,792	6	9	42	18.14
1884	Aug.	*Oregon* . . .	7,375	Cunard Line	Sandy Hook	Queenstown	2,853	6	11	9	18.52
1885	May	*Etruria* . . .	8,120	Cunard Line	Queenstown	Sandy Hook	2,821	6	5	31	18.93
1887	Mar.	*Etruria* . . .	8,120	Cunard Line	New York	Queenstown	2,890	6	4	36	19.90
1887	May	*Umbria* . . .	8,120	Cunard Line	Queenstown	Sandy Hook	2,810	6	4	42	18.89
1888	May	*Etruria* . . .	8,120	Cunard Line	Queenstown	Sandy Hook	2,872	6	2	27	19.65
1889	May	*City of Paris* (*No.* 2) .	10,500	Inman & Inl.	Sandy Hook	Queenstown	2,894	6	0	29	20.02
1889	Aug.	*City of Paris* (*No.* 2) .	10,500	Inman & Inl.	Sandy Hook	Queenstown	2,792	5	23	38	19.52
1889	Sept.	*City of Paris* (*No.* 2) .	10,500	Inman & Inl.	Queenstown	Sandy Hook	2,788	5	19	18	20.0
1889	Dec.	*City of Paris* (*No.* 2) .	10,500	Inman & Inl.	Sandy Hook	Queenstown	2,784	5	22	50	19.47
1891	Aug.	*Teutonic* . . .	9,686	White Star L.	Queenstown	Sandy Hook	2,778	5	16	31	20.43
1891	Oct.	*Teutonic* . . .	9,686	White Star L.	Sandy Hook	Queenstown	2,790	5	21	3	19.79
1892	Aug.	*City of New York* (*No.* 2)	10,500	Inman & Inl.	Sandy Hook	Queenstown	2,864	5	19	57	20.10

RECORD ATLANTIC PASSAGES 1840–1930—*Contd.*

Year	Month	NAME OF STEAMER	Gross Tons.	OWNERS	VOYAGE From	VOYAGE To	Distance N. Miles	Passage D.	Passage H.	Passage M.	Approx. Speed
1892	Oct.	*City of Paris* (*No.* 2) .	10,500	Inman & Inl.	Queenstown	Sandy Hook	2,782	5	14	24	20.70
1893	May	*Campania* . . .	12,950	Cunard Line	Sandy Hook	Queenstown	2,899	5	17	27	21.07
1893	June	*Campania* . . .	12,950	Cunard Line	Queenstown	Sandy Hook	2,873	5	15	29	21.21
1893	Sept.	*Lucania* . . .	12,950	Cunard Line	Queenstown	Sandy Hook	2,780	5	15	47	20.45
1893	Oct.	*Campania* . . .	12,950	Cunard Line	Sandy Hook	Queenstown	2,821	5	12	15	21.33
1894	May	*Lucania* . . .	12,950	Cunard Line	Queenstown	Sandy Hook	2,873	5	12	57	21.75
1894	Aug.	*Campania* . . .	12,950	Cunard Line	Queenstown	Sandy Hook	2,792	5	9	21	21.59
1894	Sept.	*Lucania* . . .	12,950	Cunard Line	Sandy Hook	Queenstown	2,810	5	8	38	21.84
1894	Oct.	*Lucania* . . .	12,950	Cunard Line	Queenstown	Sandy Hook	2,779	5	7	23	21.81
1894	Oct.	*Lucania* . . .	12,950	Cunard Line	Sandy Hook	Queenstown	2,836	5	8	38	22. 0
1897	Sept.	*Kaiser Wilhelm der Grosse*	14,349	Nord. Lloyd.	Needles	Sandy Hook	3,050	5	22	45	21.39
1897	Sept.	*Kaiser Wilhelm der Grosse*	14,349	Nord. Lloyd	Sandy Hook	Eddystone	2,962	5	15	10	21.94
1900	Aug.	*Deutschland* . .	16,502	Hamburg A.	Needles	Sandy Hook	3,073	5	20	20	21.95
1900	Aug.	*Deutschland* . .	16,502	Hamburg A.	Sandy Hook	Plymouth	3,120	5	7	38	24.37
1901	Aug.	*Deutschland* . .	16,502	Hamburg A.	Needles	Sandy Hook	3,050	5	16	5	22.39
1902	April	*Kaiser Wilhelm der Grosse*	14,349	Nord. Lloyd.	Cherbourg	Sandy Hook	3,146	5	18	35	22.70

Year	Month	NAME OF STEAMER	Gross Tons.	OWNERS	VOYAGE From	VOYAGE To	Distance N. Miles	Passage D.	Passage H.	Passage M.	Approx. Speed
1902	April	*Kaiser Wilhelm der Grosse*	13,952	Nord. Lloyd	Sandy Hook	Eddystone	3,083	5	15	0	22.84
1902	Sept.	*Kronprinz Wilhelm* .	14,908	Nord. Lloyd	Cherbourg	Sandy Hook	3,047	5	11	57	23.09
1902	Sept.	*Kronprinz Wilhelm* .	14,908	Nord. Lloyd	Sandy Hook	Cherbourg	2,966	5	11	1	22.64
1903	Aug.	*Kaiser Wilhelm II* .	19,361	Nord. Lloyd	Cherbourg	Sandy Hook	3,052	5	15	10	22.60
1903	Aug.	*Kaiser Wilhelm II* .	19,361	Nord. Lloyd	Sandy Hook	Needles	2,971	5	10	42	22.73
1905	Sept.	*Etruria* . . .	8,120	Cunard Line	Queenstown	Sandy Hook	2,780	5	10	51	21.23
1909	June	*Mauretania* . .	30,696	Cunard Line	Sandy Hook	Daunts Rock	2,933	4	17	21	25.88
1909	Aug.	*Lusitania* . . .	30,396	Cunard Line	Daunts Rock	Sandy Hook	2,784	4	11	42	25.85
1909	Sept.	*Lusitania* . . .	30,396	Cunard Line	Sandy Hook	Daunts Rock	2,808	4	15	52	25.1
1909	Sept.	*Mauretania* . .	30,696	Cunard Line	Daunts Rock	Sandy Hook	2,784	4	10	51	26.06
1909	Sept.	*Mauretania* . .	30,696	Cunard Line	Sandy Hook	Daunts Rock	2,809	4	13	41	25.61
1909	12 m.	*Mauretania* . .	30,696	Cunard Line	Daunts Rock	Sandy Hook	15 vgs.				25.39
1909	12 m.	*Mauretania* . .	30,696	Cunard Line	Sandy Hook	Daunts Rock	15 vgs.				25.47
1910	Sept.	*Mauretania* . .	30,696	Cunard Line	Daunts Rock	Sandy Hook	2,780	4	10	41	26.06
1924	Aug.	*Mauretania* . . .	30,696	Cunard Line	Cherbourg	Amb. C.L.V.	3,157	5	3	20	25. 6
1924	Aug.	*Mauretania* . .	30,696	Cunard Line	Amb. C.L.V.	Cherbourg	3,198	5	1	49	26.25

RECORD ATLANTIC PASSAGES 1840–1930—*Contd.*

Year	Month	NAME OF STEAMER	Gross Tons.	OWNERS	VOYAGE From	VOYAGE To	Distance N. Miles	Passage D.	Passage H.	Passage M.	Approx. Speed
1924	Oct.	*Mauretania* . .	30,696	Cunard Line	Amb. C.L.V.	Plymouth	3,035	4	22	47	25.68
1928	July	*Mauretania* . .	30,696	Cunard Line	Cherbourg	Amb. C.L.V.	3,160	5	3	17	25.63
1928	Aug.	*Mauretania* . .	30,696	Cunard Line	Amb. C.L.V.	Eddystone	3,084	4	21	44	26.20
1928	Sept.	*Mauretania* . .	30,696	Cunard Line	Cherbourg	Amb. C.L.V.	3,096	5	2	34	25.26
1929	July	*Bremen* . . .	51,656	Nord. Lloyd	Cherbourg	Amb. C.L.V.	3,164	4	17	42	27.83
1929	July	*Bremen* . . .	51,656	Nord. Lloyd	Amb. C.L.V.	Eddystone	3,084	4	14	30	27.91
1930	Mar.	*Europa* . . .	49,746	Nord. Lloyd	Cherbourg	Amb. C.L.V.	3,164	4	17	6	27.9

Principal Particulars of some of the World's Largest Vessels.

NAME	BUILDERS	Date	Length Ft.	Breadth Ft.	Breadth In.	Depth Ft.	Depth In.	Drght. Ft.	Drght. In.	Displacement Tons	Gross Tonnage	Engines	I.H.P.	Speed Knots
Great Eastern	J. Scott Russell	1858	680	83	0	57	6	25	6	27,000	24,360	Paddle & screw	7,650	14.5
Paris and *New York*	Clydebank Works	1888	528	63	0	41	0	23	0	13,000	10,499	Reciprocating	20,600	21.8
Teutonic and *Majestic*	Harland & Wolff	1890	565	57	6	42	2	22	0	12,000	9,686	Reciprocating	19,500	21
Fürst Bismarck	Vulcan Co., Stettin	1891	503	57	3	38	0	22	6	10,200	8,000	Reciprocating	16,412	20.7
Campania and *Lucania* .	Fairfield Co.	1893	600	65	0	41	6	23	0	18,000	12,950	Reciprocating	30,000	22.01
St. Louis and *St. Paul* .	Cramp, Phil'phia.	1895	536	63	0	42	0	26	0	16,000	11,629	Reciprocating	18,000	21.08
Kaiser Wilhelm der Grosse .	Vulcan Co. Stettin	1897	625	66	0	43	0	28	0	20,880	14,349	Reciprocating	30,000	22.5
Oceanic .	Harland & Wolff	1899	685	68	5	49	0	32	6	28,500	17,274	Reciprocating	27,000	20.72
Deutschland	Vulcan Co., Stettin	1900	662.9	67	0	44	0	29	0	23,620	16,502	Reciprocating	36,000	23.5
Kronprinz Wilhelm	Vulcan Co., Stettin	1901	663 o.a.	66	0	43	0	29	0	21,300	14,908	Reciprocating	36,000	23.5
Kaiser Wilhelm II	Vulcan Co., Stettin	1903	678	72	0	52	6	29	0	26,000	19,361	Reciprocating	38,000	23.5
La Provence	St. Nazaire Works	1906	597	64	7½	41	8	26	9	19,160	13,750	Reciprocating	30,000	22.05

PRINCIPAL PARTICULARS OF SOME OF THE WORLD'S LARGEST VESSELS—*contd.*

NAME	BUILDERS	Date	Length Ft.	Breadth Ft. In.	Depth Ft. In.	Drght. Ft. In.	Displacement. Tons	Gross Tonnage	Engines	I.H.P.	Speed Knots
Mount Vernon (ex *Kronprinzessin Cecilie*)	Vulcan Co., Stettin	1907	678	72 0	52 6	29 0	26,000	19,503	Reciprocating	38,000	23.5
Lusitania	John Brown & Co., Clydebank	1907	760	87 6	60 0	32 6	36,500	30,396	Turbines	S.H.P. 76,000	25.5
Mauretania	Swan, Hunter & W. Richardson, Ltd.	1907	760	87 6	60 6	32 6	36,500	30,696	Turbines	78,000*	26.0
Olympic	Harland & Wolff, Belfast	1911	852.5	92 6	59.9	34.7		46,439	Reciprocating and turbines	55,000	22.5
Berengaria (ex *Imperator*)	Vulcan Co., Hamburg	1912	883.6	98.3	57.1	39 0		52,226	Turbines		23.5
Aquitania	J. Brown & Co., Clydebank	1914	867.7	97 0	49.7	36 2		45,647	Turbines		24.5
Leviathan (ex *Vaterland*)	Blohm & Voss, Hamburg	1914	907.6	100.3	58.2	39 6		59,956	Turbines		24.0
Majestic (ex *Bismarck*)	Blohm & Voss, Hamburg	1922	915.5	100.1	58.2	38 10		56,620	Turbines		24.5
Bremen	Weser, Bremen	1929	938.25	102	54	31 9	52,000	51,656	Turbines	140,000	28
Europa	Blohm & Voss, Hamburg	1930	936	101				49,746	Turbines	140,000	28

* The original power was augmented when the vessel was converted to oil-burning shortly after the War, and latterly, by alterations to the condensing plant, etc.

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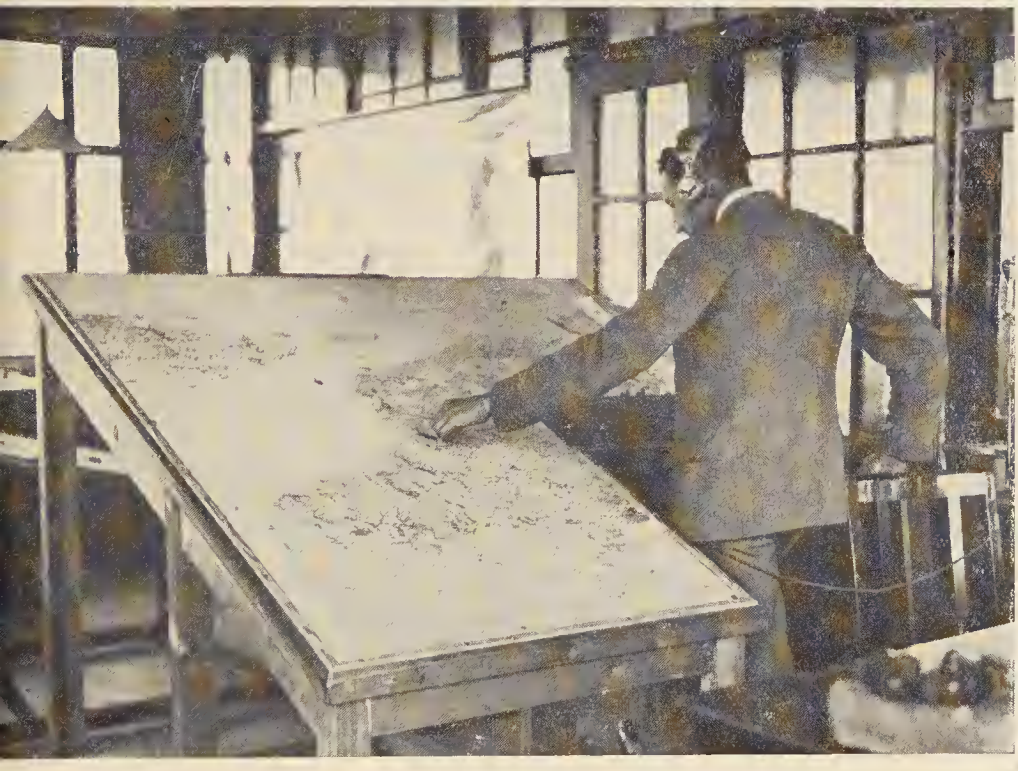

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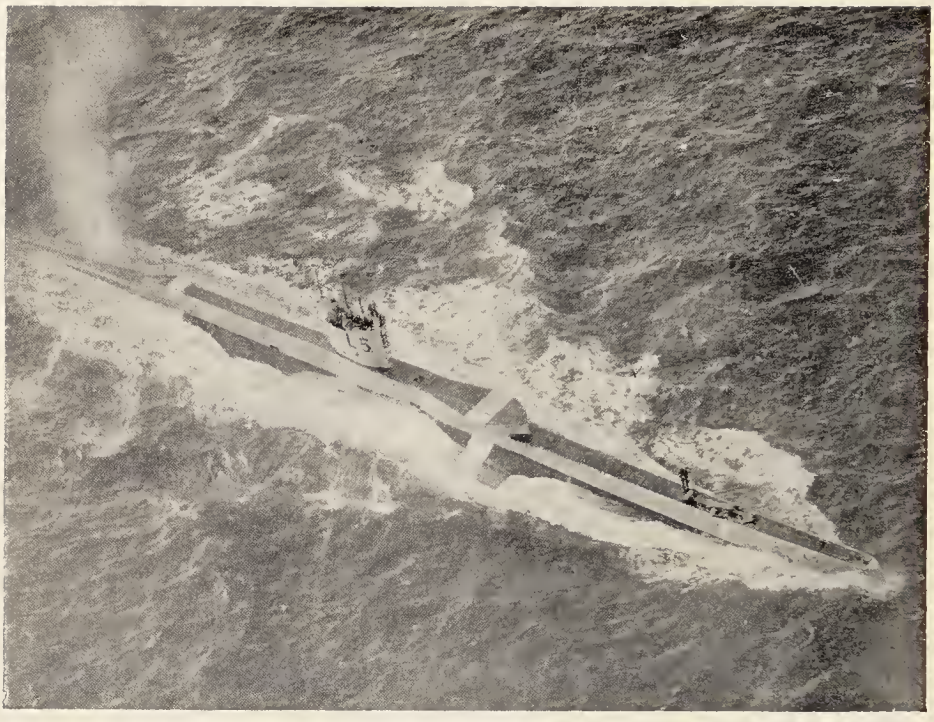

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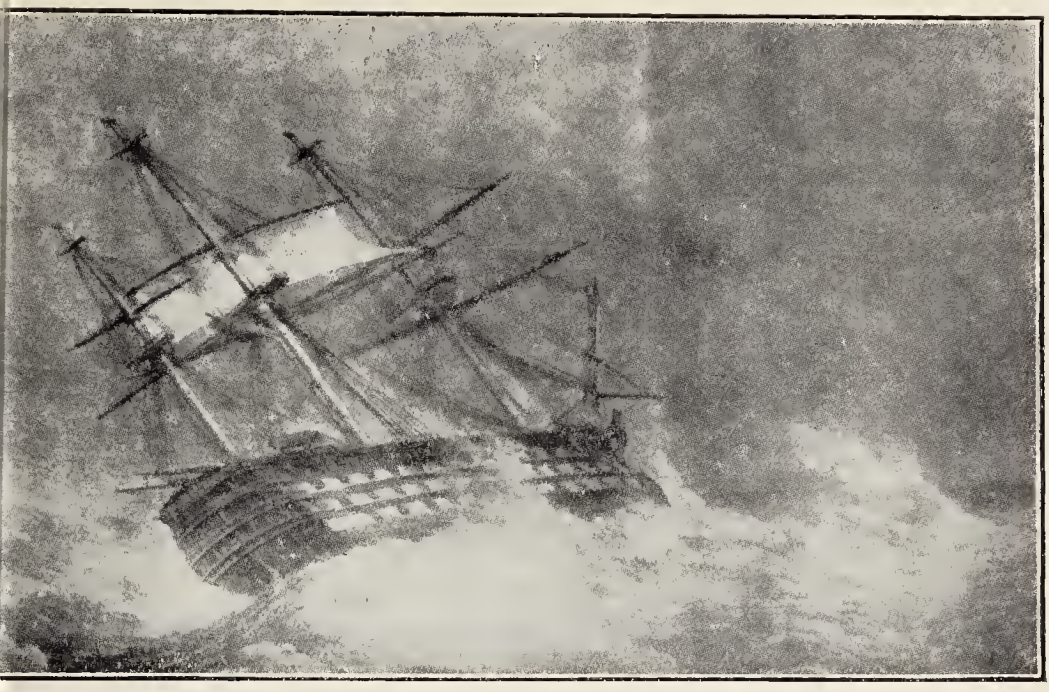

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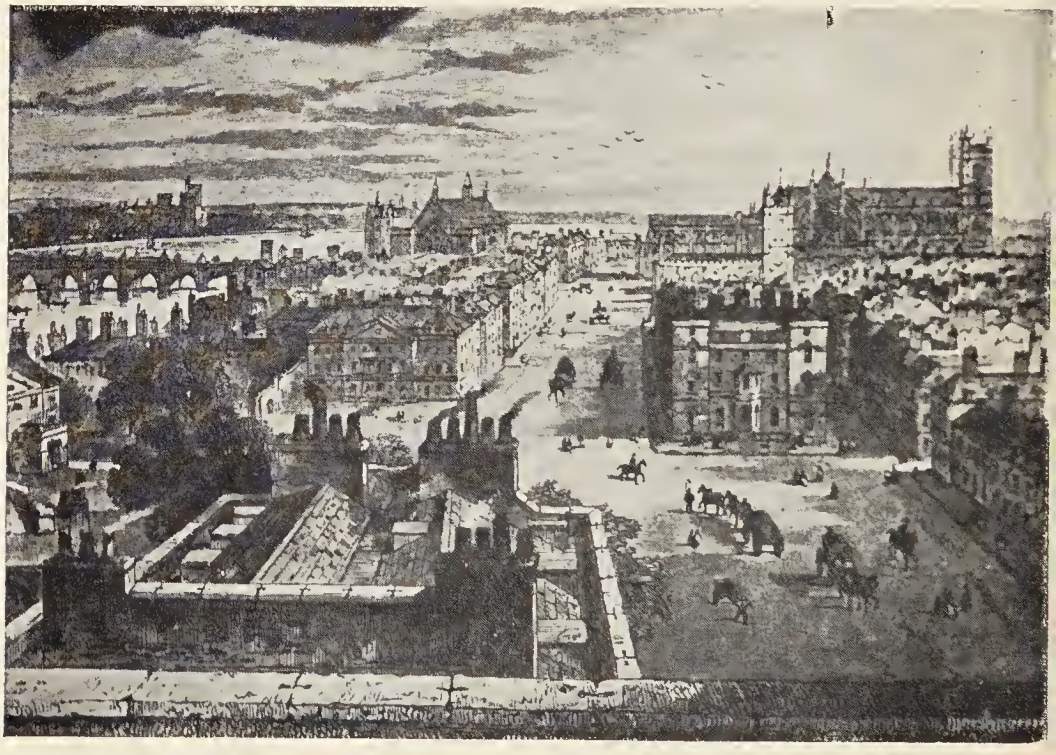

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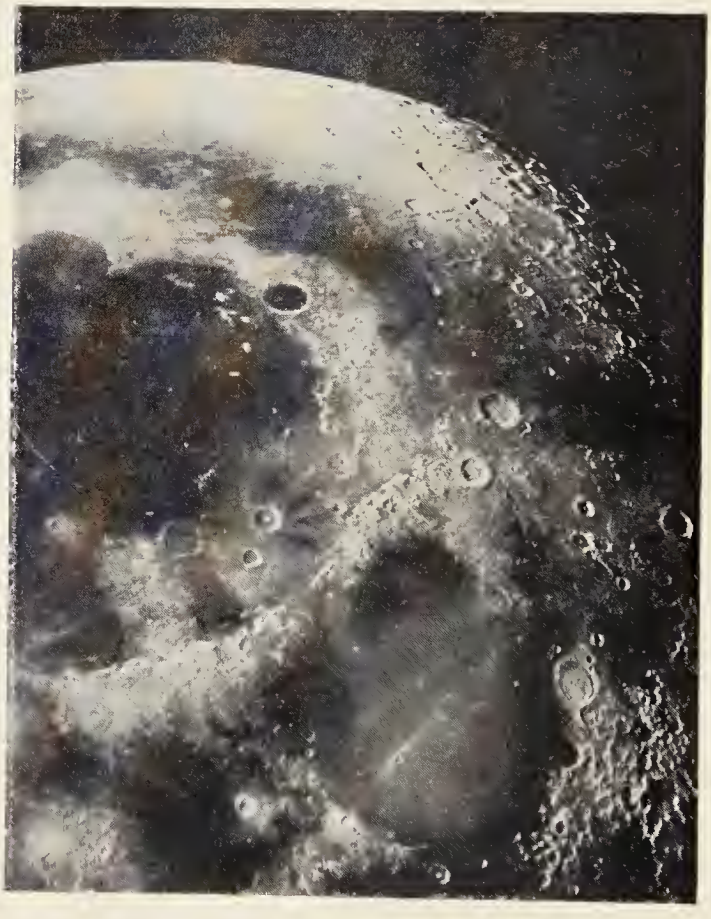

[*Mount Wilson Observatory*

NORTHERN PORTION OF THE MOON.

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